FINAL REPORT
ATTACHMENTS

NL/TARACORP SUPERFUND SITE GRANITE CITY, ILLINOIS

Prepared for

U.S. Envrionmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

March, 1993

U.S. Department of the Army
Corps of Engineers, Omaha District
Omaha, Nebraska

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Woodward-Clyde

Woodward-Clyde Consultants
2318 Millpark Drive
St. Louis, Missouri 63043

WCC Project No. 89MC114V

ATTACHMENT 1

PLAN FOR SATISFACTION OF PERMITTING REQUIREMENTS (PSPR)

The PSPR describes the permitting requirements for the remediation at the NL/Taracorp Superfund Site. The plan is divided into three sections based on the different types of areas within the site: residential, industrial and remote areas. The residential area includes the residential lots, parks, schools, churches, and other public facilities within Granite City, Madison, and Venice. The industrial property includes Taracorp, Trust 454, Rich Oil and BV&G Transportation properties. The remote areas include Venice Alleys, Eagle Park Acres, Missouri Avenue, 3108 Colgate Avenue, 1628 Delmar Avenue, Schaeffer Road, 2230 Cleveland Avenue, and Sand Road. Permitting requirements will differ for each area due to varying waste type, waste transportation requirements, and varying disposal needs.

While not required, it is recommended that a formal letter outlining the scope of work that will be undertaken should be sent to the local governing bodies of Granite City, Madison, and Venice for their review. This information should be delivered at least four to six weeks prior to the start of any remediation activities. It is advisable to keep the local officials informed of remediation activities, schedule, and any changes that may occur. Their assistance in implementing this plan may prove invaluable as remediation activities proceed.

The plan includes procedures and estimated time frames necessary to acquire these permits and clearances. Estimated time frames for each permit are listed in **Tables 5-1, 5-2 and 5-3**. Names and telephone numbers of organizations and agencies that will need to be contacted are included **in Table 5-4**.

The actual time required for regulatory agency review and approval of project submittals can be highly variable and is beyond the control of the USACE, USEPA, and WCC. It is recognized that if extended periods of time are required for review, it will likely have an adverse effect on the estimated schedule presented herein.

1.0
INDUSTRIAL PROPERTY PLAN

The remedial action for the Main Industrial Property requires that all unpaved areas with soil lead concentrations greater than 1,000 ppm be excavated and incorporated into the Taracorp slag pile. The remediated areas will then be restored to their original state. The Main Industrial Property includes Taracorp, Trust 454, Rich Oil and BV&G Transportation properties. The PSPR for the industrial property corresponds with the remedial action tasks which include waste excavation, waste disposal, and restoration.

1.1 WASTE EXCAVATION AND RESTORATION TASK

In order to excavate all soil on the Main Industrial Property with greater than 1000 ppm and incorporate it into the NL/Taracorp pile, the following permits and clearances will be necessary:

1.0 A signed property access agreement from each property owner. If a property owner is unwilling to grant access, a court order/warrant will be necessary. Contact the USEPA project manager for property owner list.

2.0 Construction permits from the Granite City Public Works Director for any remedial work conducted within the city's easement area.

3.0 Disposal of decontamination water. Obtain permission from the Granite City Sewer District to dispose of water into storm water sewer or sanitary sewer lines.

4.0 Notification of Municipal Street Departments to obtain clearance for any interruption of street/traffic lights.

5.0 Notification of each utility company to check for underground utility lines prior to excavation. The "JULIE" system in Illinois contacts most utility companies. Utility companies to contact for the Main Industrial Property include:

- Illinois Power Company
- Illinois American Water Company
- Illinois Bell Telephone Company
- Mississippi River Transmission Corporation
- MCI Telecommunications Corporation
- AT&T Company

6.0 NPDES Storm Water Land Disturbance Permit from the IEPA if an excavation site is larger than 5 acres.

7.0 Air permit from IEPA. The permit will include methods and procedures to control dust during excavation.

1.2 STABILIZATION OF HAZARDOUS WASTE

The soil excavated from the Main Industrial Property will be characterized as "hazardous" if it fails the Toxicity Characteristic Leaching Procedure (TCLP) and must be stabilized to the Best Demonstrated Available Technology (BDAT) treatment standards prior to disposal. After stabilization if the "hazardous" waste passes TCLP, the waste may be de-characterized as "hazardous" and re-classified as "special". It is expected that the stabilized waste will pass TCLP. If the stabilized material does not pass TCLP due to lead leachate concentrations in excess of 5 mg/liter, the waste material is classified as land banned and cannot be disposed of on-site or at a landfill facility until it has been stabilized so that it passes TCLP. Any material that cannot be stabilized to pass TCLP will need to be transported to a secondary lead smelting facility that is permitted to handle this type of material. All waste material originally classified as "special" waste (passes TCLP) will not have to be treated and can be disposed of on-site.
For "hazardous" waste (fails TCLP), stabilization can be performed using either of two scenarios:

A. Treatment could be performed at the Main Industrial Property. This would include treatment of the "hazardous" waste from both the main site and the Remote Fill Areas, and would require only one treatment facility.

B. Treatment could be performed at an off-site permitted RCRA hazardous waste management facility. This could either be a RCRA-compliant landfill or a secondary smelter, depending on the type and volume of material.

Depending on which treatment scenario is be used, permitting and clearance requirements include the following:

Option A: Stabilization Facility at Main Industrial Site Property

The most likely scenario would utilize a treatment facility at the Main Industrial Property. Prior to any permitting, the design of the treatment facility will need to be approved by the USACE project manager, USEPA and IEPA. Concurrence of the local city governments is also recommended.

The treatment facility should include:

- Receiving processes and functions

  - Unloading
  - Decontamination of equipment and personnel
  - Inventory and documentation
  - Sampling
  - Composition verification
  - Weight and volume determinations
  - Reagent and waste storage
  - Distribution for processing
  - Spill control

- Treatment processes

  - Stabilization process that meets BDAT treatment standards

- Emissions, effluents, and disposal functions

  - Production storage for quality control
  - Product analysis
  - Run-on and Run-off control systems
  - Wind dispersal control plan

- Support area and hazard prevention plans

  - Field office
  - Analytical lab
  - Security system
  - Emergency response procedures
  - Contingency plan

Permits and clearances required for the treatment facility include:

1.0 NPDES permit for wastewater and storm water discharge from the IEPA.

2.0 Air permit from the IEPA.

Option B: Stabilization Facility Off-site at a RCRA Hazardous Waste Management Facility

An alternative scenario would utilize an off-site RCRA-permitted facility to dispose of "hazardous" material. A permitted RCRA Hazardous Waste Management Facility can store, stabilize and dispose of the "hazardous" waste. The facility can utilize BDAT stabilization methods that will be accepted by the USACE, USEPA, and IEPA. Most facilities will also conduct laboratory analyses, stabilization studies, and help with permitting. No permits are required for the stabilization procedures, but are required for disposal.

1.3 WASTE DISPOSAL TASK

Option A: Disposal at the Main Industrial Property

Any material that is excavated from the Main Industrial Property will be incorporated into the NL/Taracorp pile. Prior to any permitting, the waste disposal facility design will need to be approved by USACE, USEPA and IEPA. The waste disposal facility design should comply with solid waste disposal facility criteria described in 40 CFR 257 and 258. Concurrence of the Granite City Council is also recommended.

The waste disposal facility design should include the following processes and systems:

- Receiving processes and functions

  - Unloading
  - Decontamination of equipment and personnel
  - Inventory and documentation
  - Sampling
  - Composition verification
  - Weight and volume determinations
  - Spill control

- Design of landfill system

  - Liner system
  - Construction and maintenance plan
  - Cap liner system
  - Run-on and run-off control systems
  - Wind dispersal control plan

- Support plans and hazard prevention plans

  - Field office
  - Hazard prevention plans
  - Security system
  - Emergency response procedures
  - Groundwater monitoring and protection plan
  - Contingency plan

Necessary permits and clearances required for the disposal facility will include:

1.0 Utility checks as explained in section 1.1, step 5.0. Obtain approval to relocate all utilities which will be located underneath the expanded landfill area.

2.0 Identification and elimination of vertical and horizontal migration pathways (i.e., abandoned sewer systems, utility lines)

3.0 NPDES permit for storm water and wastewater discharge from the IEPA.

4.0 Disposal of decontamination water from equipment and personnel decontamination operations. Obtain permission from the Granite City Sewer District to dispose water into storm water or sanitary sewer lines.

5.0 Air permit from the IEPA. The permit will include methods and procedures to control dust during disposal operations.

Option B: Disposal Off-site at a Municipal Waste Management Facility

Due to space constraints and/or political considerations, it may become necessary to dispose of all or part of the lead contaminated soil from the Adjacent Residential Areas at an off-site special waste landfill. Permits and clearances required by the disposal facility include:

- A generic permit issued by the IEPA to each hazardous waste management facility for specific waste streams with specific parameters. A full test package is required to prove the material falls within the parameters of the Generic permit.

- A supplemental permit if the material falls outside the parameters for a generic permit. The supplement permit serves as IEPA approval for the facility to process the special waste stream.

- A separate waste profile for each generator number may be required by the disposal facility.

2.0 RESIDENTIAL AREA PLAN

The remedial action for the residential area requires that residential lots with a soil lead concentration greater than 500 ppm be excavated and restored with clean topsoil. The soil waste will be stabilized, if "hazardous", and will be disposed of either by incorporation into the Taracorp Pile or at off-site landfill facilities. The PSPR corresponds with the remedial action tasks which include:

- waste excavation and restoration
- waste transportation
- waste stabilization, if "hazardous" (fails TCLP)
- waste disposal as either "special" or "hazardous"

2.1 WASTE EXCAVATION TASK

The excavation of the soil in the residential area consists of removing contaminated soil from unpaved areas in yards with soil lead concentrations greater than 500 ppm. This will include soil from the easement area (city right-of-way), located between the street and front sidewalk.

To accomplish this, the following permits and clearances are required for the waste excavation task:

1.0 Written notification of each city council (Granite City, Madison and Venice) prior to the start of any remediation activities.

2.0 Construction permits from each city engineer or public works director if remedial work is to be conducted within the easement areas.

3.0 A signed property access agreement from each resident. If resident is unwilling to grant access, a court order/warrant will be necessary.

4.0 Notification of each city's police and fire departments if specific streets or alleys will be blocked off during excavation of the residential lots. Provide an outline showing excavation areas and time schedules. Obtain suggestions for traffic routing and control. If water or electricity will be needed for excavation, obtain utility connection permits.

5.0 Notification of each city's street department to obtain clearance for any interruption of street lights and traffic signals.

6.0 Disposal of decontamination water. Obtain permission from the Granite City area sewer district to dispose water in storm water sewer lines.

7.0 Notification of each utility company to check for underground utility lines prior to excavation. The "JULIE" system in Illinois contacts most utility companies. For the residential area, most utilities should be below the one foot excavation interval, although there is the possibility some lines may be above this level. Utility companies to contact when working in residential areas include:

- Illinois Power Company
- Illinois American Water Company
- Mississippi River Transmission Company
- Cencom Cable

8.0 NPDES Storm Water Land Disturbance Permit from the IEPA for sites larger than 5 acres.

9.0 IEPA air permit. The permit will include methods and procedures to control dust during excavation.

2.2 WASTE TRANSPORTATION TASK

Prior to transporting any material from the residential areas to the Main Industrial Property, the following will be necessary:

1.0 Determine if hauling "hazardous" waste within the residential area will have special transportation requirements in addition to manifesting even though the area is within the "NL/Taracorp Superfund Site". This will need to be discussed and approved by the USACE project manager, IDOT, IEPA, and USEPA.

2.0 Prepare decontamination procedures plan for transportation equipment. This will require the approval of each agency listed above.

3.0 Prepare the IEPA six-part Uniform Hazardous Waste Manifest for each truckload of hazardous and special waste. Land Disposal Restriction (LDR) forms for lead contaminated (D008) waste, and submitted to the USEPA-Region V. Generator numbers (IEPA and USEPA non-small quantity generator) are required for manifesting. A separate generator number is required for each waste "site". The "generator" (USEPA - Region 5) must sign each manifest.

2.3 STABILIZATION OF HAZARDOUS WASTE

The soil excavated from the residential lots will be characterized as "hazardous" if it fails TCLP. If it is characterized as hazardous it must be stabilized to BDAT treatment standards prior to disposal. After stabilization if the hazardous waste passes TCLP, the waste may be de-characterized as "hazardous" and will be re-classified as "special". It is expected that the stabilized waste will pass TCLP. If the stabilized material does not pass TCLP due to lead concentrations in excess of 5 mg/liter, the waste material is classified as land banned and cannot be disposed of at the main industrial site or in any landfill until it has been stabilized to pass TCLP. Any material that cannot be stabilized to pass TCLP will need to be transported to a secondary lead smelting facility that is permitted to handle this type of material. Waste originally classified as "special" waste (passes TCLP) will not have to be treated, and can be disposed of either at the NL/Taracorp pile or at a "special" waste landfill.

For "hazardous" waste (fails TCLP) from the residential areas, the stabilization options are discussed in section 1.2.

2.4 WASTE DISPOSAL

The wastes from the residential lots may be disposed of at several locations and will require different permit procedures. Waste that is classified as a "special" waste (passing TCLP), it may either be disposed of at the industrial site or at a municipal landfill permitted for "special" waste disposal. It is not anticipated that any residential soil waste will be classified as " hazardous", requiring disposal in a RCRA compliant facility.

Depending on which disposal facility is chosen, the following permits and clearances required:

Option A: Disposal at the Main Industrial Property

Disposal of waste material on-site would require incorporating the waste material into the NL/Taracorp pile. The last phase of the process would be the installation of a RCRA-compliant cap over the enlarged and reconfigured pile. Prior to any permitting, the waste disposal facility design will need to be approved by USACE, USEPA, IEPA and local city governments.

The waste disposal facility design for on-site disposal is discussed in section 1.3.

Option B: Disposal Off-site at a Municipal Waste Management Facility

Due to space constraints and/or political considerations, it may became necessary to dispose of all or part of the lead contaminated soil from the Adjacent Residential Areas at an off-site special waste landfill. Permits and clearances required by the disposal facility are described in section 1.3.

Option C: Disposal Off-site at a RCRA-compliant Disposal Facility

A permitted RCRA Hazardous Waste Management Facility can store, treat and dispose of the hazardous waste. The facility will utilize a method that can meet BDAT treatment standards and will be accepted by the USACE, USEPA, and IEPA. Most facilities will also conduct laboratory analyses, stabilization studies, and assist with permits. No permits are required for the stabilization process, but are required for disposal. A disposal facility of this type would only be utilized in the unlikely event that waste material classified as "hazardous" could not be stabilized on-site and disposed of either on-site or at a "special" waste facility.

3.0
REMOTE FILL AREAS PLAN

The remedial action plan requires that Remote Fill Areas, except for alleys and driveways, with soil lead concentrations greater than 500 ppm be excavated and restored with clean topsoil. Alleys and driveways in these areas that contain rubber battery chips will be excavated, and restored with a suitable pavement material. The soil and battery casing material will be stabilized if classified as "hazardous" (fails TCLP), and will be disposed of either by incorporation into the Taracorp Pile or in off-site landfill facilities. The PSPR corresponds with the remedial action tasks which include:

- waste excavation and restoration
- waste transportation
- waste treatment, if hazardous (fails TCLP)
- waste disposal as either "special" or "hazardous"

3.1 WASTE EXCAVATION TASK

The excavation task in the Remote Fill Areas will consist of removal of all battery casing material and contaminated soil. Permits and clearances required for waste excavation include:

1.0 A signed property access agreement from each property owner. If a property owner is unwilling to grant access, a court order/warrant will be necessary. Contact the USEPA-Region V project manager for the property owner list.

2.0 Construction permits from the City Engineer or Public Works Director responsible for each of the Remote Fill Areas for remedial work conducted on any public easements that cross these sites.

3.0 Disposal of decontamination water. Obtain permission from the Granite City Sewer District to dispose of water into the storm sewer system.

4.0 Notification of each city's police and fire departments if specific streets or alleys will be blocked off during excavation of the residential lots. Provide an outline showing excavation areas and time schedules. Obtain suggestions for traffic routing and control. If water or electricity will be needed for excavation, obtain utility connection permits.

5.0 Notification of each city's street department to obtain clearance for interruption of street lights and traffic signals.

6.0 Utility checks as explained in section 1.1, step 5.0.

7.0 NPDES Storm Water Land Disturbance Permit from the IEPA if an excavation site is larger than 5 acres.

8.0 Air permit from IEPA. The permit will include methods and procedures to control dust during excavation.

3.2 WASTE TRANSPORTATION TASK

Prior to transporting any material from the Remote Fill Areas though residential areas to the appropriate disposal facilities, it will be necessary to follow the steps outlined in section 2.2.

3.3 STABILIZATION OF HAZARDOUS WASTE

The soil and battery casing material excavated from the Remote Fill Areas will be characterized as "hazardous" if it fails TCLP and must be stabilized to the BDAT treatment standards prior to disposal. After stabilization if the hazardous waste passes TCLP, the waste may be decharacterized as hazardous and will be reclassified as special. It is expected that the stabilized waste will pass TCLP. If the material does not pass TCLP due to lead concentrations in excess of 5 mg/liter, the waste material is classed as land banned and cannot be disposed of in any landfill until it has been stabilized so that it passes TCLP. Any material that cannot be stabilized so that it can pass TCLP will need to be transported to and disposed of at a secondary lead smelting facility that is permitted to handle this type of material. All waste classified as "special" waste (passes TCLP) will not have to be treated.

Three different treatment scenarios are possible: 1. Treatment at a central treatment facility constructed at the Main Industrial Property; 2. Treatment at satellite facilities constructed at each of the Remote Fill Areas; and 3. Treatment at a remote disposal facility. Permitting and clearance requirements will differ depending on which treatment scenario is used.

Option A: Stabilization Facility at the Main Industrial Property

A treatment facility at the Main Industrial Property would be the most efficient and cost effective way to handle the proposed waste stream. Facility design and permit requirements are discussed in section 1.2.

Option B: Satellite Stabilization Facilities at each Remote Fill Area

If it is not feasible to transport the "hazardous" waste through residential areas for treatment at the Main Industrial Property, satellite treatment facilities may be required at the Remote Fill Areas to treat and stabilize the material prior to transport. Prior to any permitting, the design of the satellite treatment facility will need to be approved by the USACE, USEPA and IEPA. Concurrence of the local city governments is also recommended.

The satellite treatment facility should include the same functions and processes as would be required for a central treatment facility (option A).

Permits and clearances required for the treatment facilities would be the same ones required for Option A.

Option C: Stabilization at an Off-site RCRA Hazardous Waste Management Facility

A permitted RCRA Hazardous Waste Management Facility can store, treat, and dispose of the hazardous waste. Depending on the type of waste material, this facility could either be a RCRA-compliant landfill or a secondary lead smelter. The facility can utilize a treatment method that will meet BDAT treatment standards and will be accepted by the USACE, USEPA, and IEPA. Most facilities will also conduct laboratory analyses, stabilization studies, and help with permitting. No permits are required for the treatment phase, but are required for disposal.

3.4 WASTE DISPOSAL TASK

The wastes from the Remote Fill Areas can potentially be disposed of at several locations, with each requiring different permitting procedures. For waste that can be classified as "special" waste (passing TCLP), disposal is acceptable at either the Main Industrial Property or at a municipal landfill permitted for "special" waste. Waste that has been classified as "hazardous" (fails TCLP) will require stabilization prior to disposal.

The permits and clearances will vary depending on which type of disposal facility is utilized and are discussed in section 1.3.

TABLE 1.0 PERMITS AND CLEARANCES TIME SCHEDULE MAIN INDUSTRIAL PROPERTY

Permit / Clearance	Agency	Time Required
City Council Approvals	Local Government	4-6 Weeks
Property Access	USEPA	2-4 Months
Construction Permits	Public Works Director	2-4 Weeks
Water Disposal	Local Granite City Regional Sewer System	2-4 Weeks
Utility Clearances	"JULIE"	1-2 Week
Utility Clearances	Local Utilities	4 Weeks
Sewer Line Excavation Clearance	Public Works Director	2-4 Weeks
Street/Traffic Light Clearance	Street Department	2-4 Weeks
NPDES Wastewater Permit	IEPA	6-12 Weeks
NPDES Storm Water Permit	IEPA	6-12 Weeks
Wind Dispersal Control Plan	Multiple Agencies	6-12 Weeks
Street/Alley Blockage Schedule	Fire/Police Departments	2-4 Weeks
Utility Connection Permits	Fire Departments	2-4 Weeks
Air Permit	IEPA	6-12 Weeks

TABLE 2.0 - PERMITS AND CLEARANCES TIME SCHEDULE RESIDENTIAL AREAS

PERMIT/CLEARANCE	AGENCY	TIME REQUIRED
City Council Approvals	Local Governments	4-6 Weeks
Property Access	USEPA	4-12 Months
Construction Permits	City Engineer or Public Works Director	2-4 Weeks
Water Disposal	Granite City Regional Sewer System	2-4 Weeks
Utility Clearances	"JULIE"	1-2 Weeks
Utility Clearances	Local Utilities	4 Weeks
Sewer Line Excavation Clearance (If needed)	City Engineer or Public Works Director	2-4 Weeks
Street/Traffic Light Clearance	Street Department	2-4 Weeks
NPDES Wastewater Permit	IEPA	6-12 Weeks
NPDES Storm Water Permit	IEPA	6-12 Weeks
Street/Alley Blockage Schedule	Fire/Police Departments	8-12 Weeks
Utility Connection Permits	Fire Department	2-4 Weeks
Air Permit	IEPA	6-12 Weeks
Decontamination Procedures Plan	Multiple Agencies	6-12 Weeks
Uniform Hazardous Waste Manifest	IDOT, IEPA	2-8 Weeks
Treatment Facility Design Approval	Multiple Agencies	6-12 Weeks
Disposal Permits	IEPA	2-8 Weeks

TABLE 3.0 - PERMITS AND CLEARANCES TIME SCHEDULE REMOTE FILL AREAS

PERMIT/CLEARANCE	AGENCY	TIME REQUIRED
Construction Permits	City Engineer or Public Works Director	4-12 Months
Property Access	USEPA	2-4 Months
Water Disposal	Granite City Regional Sewer System	2-4 Weeks
Utility Clearances	"JULIE"	1-2 Weeks
Utility Clearances	Local Utilities	4 Weeks
Sewer Line Excavation Clearance	City Engineer or Public Works Director	2-4 Weeks
Street/Traffic Light Clearance	Street Department	2-4 Weeks
NPDES Wastewater Permit	IEPA	6-12 Weeks
NPDES Storm Water Permit	IEPA	6-12 Weeks
Street/Alley Blockage Schedule	Fire/Police Departments	2-4 Weeks
Utility Connection Permits	Fire Department	2-4 Weeks
Air Permit	IEPA	6-12 Weeks
Documentation Procedures Plan	Multiple Agencies	6-12 Weeks
Uniform Hazardous Waste Manifest	IDOT, IEPA	2-8 Weeks
Treatment Facility Design Approval	Multiple Agencies	6-12 Weeks
Disposal Permits	IEPA	2-8 Weeks
Waste Disposal Facility Design Approval	Multiple Agencies	6-12 Weeks

TABLE 4.0 - AGENCIES AND ORGANIZATIONS RESPONSIBLE FOR PERMITS AND CLEARANCES

AGENCY	CONTACT (if known)	TELEPHONE
USACE ATTN: CEMRO-ED-ED 215 North 17th Street Omaha, NE 68102	Eugene Liu Project Manager	(402) 342-0051
USEPA-Region V, 5HS-11 77 W. Jackson, 6th Floor Chicago, IL 60604	Brad Bradley Project Manager	(312) 886-4742
IEPA 2200 Churchill Road P.O. Box 19276 Springfield, IL 62794	Brian Kulman Project Manager	(217) 782-6761
Granite City Board of Aldermen	Mayor Von Dee Cruse	(618) 452-6214
Madison City Council	Mayor John Bellcoff	(618) 451-4838
Venice City Council	Mayor Tyrone Echols	(618) 452-8539
Granite City Public Works Director	Brett Henke	(618) 452-6218
Madison City Engineer	Rob Robbins Superintendent of Streets	(618) 876-6268
Venice City Engineer	Joe Juneau	(618) 877-1400
Granite City Regional Sewer System 2000 Edison Avenue Granite City, IL 62040	Terry Kellahan Superintendent	(618) 452-6230
Granite City Police 2330 Madison Avenue Granite City, IL 62040	Chief of Police	(618) 451-9760
Granite City Fire Dept. 2300 Madison Avenue	Fire Chief	(618) 877-6114

AGENCY	CONTACT (if known)	TELEPHONE
Granite City Street Dept. 2301 Adams Street Granite City, Il 62040		(618) 452-6222
Madison Police 1529 3rd Street Madison, IL	Chief of Police	(618) 876-4300
Madison Fire Dept. 1529 3rd Street Madison, IL	Fire Chief	(618) 876-4300
Superintendent of Streets 1526 3rd Street Madison, IL	Rob Robbins	(618) 876-6268
"JULIE"		(800) 892-0123
Illinois Power Company	Bill Johnson	(618) 798-6285
Illinois American Water Company	Dave Schwierjohn	(618) 876-0011
Mississippi River Transmission Corporation	Red Barnes	(618) 281-7167
S M & P (clear utilities for Illinois Power & Illinois Bell)	Mike McCartney	(618) 233-6999
Cencom Cable Television		(618) 345-8506 (800) 233-0117
M C I Telecommunications	Phillip Christensen	(800) MCI-WORK (618) 274-0010
A T & T	Ron Keller	(618) 973-8884 (618) 885-5432
IEPA Water Pollution Control	Thomas McSwiggen Roland Sharp	(217) 782-3362
IEPA Air Pollution Dept.	Mike Davidson	(217) 782-2113

AGENCY	CONTACT (if known)	TELEPHONE
IEPA RCRA Permitting Land Pollution Control	Kevin Lesko	(217) 782-6760
IEPA Transportation Permitting	Karen Hoffman	(217) 782-2113
IDOT 1100 Eastport Plaza Drive Collinsville, IL 62234	Mary Lamey	(618) 346-3100

ATTACHMENT 2

IDENTIFICATION OF RCRA COMPLIANT LANDFILL

DISPOSAL OF LEAD CONTAMINATED SOIL AND BATTERY CASING MATERIAL FROM THE NL/TARACORP SUPERFUND SITE

The alternatives available for the disposal of lead contaminated soil and battery casing material at the NL/Taracorp Superfund Site are dependent upon the material's waste classification. The classification of the material is based upon the results of the Toxicity Characteristic Leachate Procedure (TCLP). Under RCRA, materials which have lead concentrations of 5 mg/l or greater by TCLP analysis are classified as hazardous. Material with lead concentrations of less than 5.0 mg/l are not regulated under RCRA. These materials are classified as special wastes.

Regulatory Background

Special wastes are regulated under 35 Illinois Administrative Code (IAC) Subtitle G. Special wastes may be disposed of in a landfill permitted or otherwise authorized to handle such wastes. Most commercial and municipal landfills (Subtitle D facilities) are permitted to handle special wastes.

The obligations for generators of special wastes are outlined in 35 IAC Section 808.121. Under the Code, special wastes must be transported to the disposal site by a licensed special waste hauler. Special waste shipments must be accompanied by a manifest prepared in accordance with 35 IAC Section 809.501.

As indicated previously, material which contains lead in concentrations of 5.0 mg/l or greater by TCLP analysis is regulated as a characteristic waste under RCRA. This material is classified by the waste code D008. Hazardous waste disposal restrictions are detailed in 40 CFR Part 268. Under RCRA, the concentration of leachable lead in any single grab sample of a D008 waste must be at or below 5.0 mg/l in order for the material to be placed in a landfill. Wastes with leachable lead concentrations greater than 5.0 mg/l must be treated prior to disposal. USEPA has determined that the Best Developed Available Treatment (BDAT) for D008 wastes is stabilization.

Under the Land Disposal Restrictions (LDR) program, a D008 treatment subcategory was established for lead acid batteries. The LDR provisions require that waste in this subcategory be treated by thermal recovery. In the preamble to the Third Land Disposal Restrictions, the U.S. Environmental Protection Agency (USEPA) specifically states that residuals from lead recovery processes do not fall into the lead acid battery subcategory and therefore may be stabilized and land disposed **(Attachment 1)**.

A characteristic waste is no longer considered hazardous once it has been treated to remove the characteristic. Therefore, a D008 waste which has been stabilized and no longer contains leachable lead in excess of the regulatory level may be treated as a special waste and disposed of in a Subtitle D landfill.

<u>Disposal Options</u>

The requirements for treatment and disposal of lead contaminated soil and battery casing materials are discussed in the paragraphs above and are summarized below:

- Material with a leachable lead concentration of less than 5.0 mg/l is classified as special waste and may be disposed of in a Subtitle D landfill permitted to handle special waste.

- Material with a leachable lead concentration greater than 5.0 mg/l must be treated to lower the leachable lead concentration to 5.0 mg/l prior to disposal. If the treated material has a leachable lead concentration of less than 5.0 mg/l, the it may be disposed of as special waste.

One option being considered calls for the construction of an on-site land disposal unit in which special wastes will be placed. An alternative to disposing of special wastes on-site would be to manifest them to a Subtitle D landfill. The following options are available for the disposal of material which is classified as hazardous:

- Manifest the material to a RCRA permitted facility for treatment and disposal

- Manifest the material to a RCRA permitted facility for treatment, then re-manifest the material as a special waste and return it to the on-site disposal unit or ship it to a Subtitle D landfill

- Stabilize the material on-site and dispose of it in the on-site disposal unit or in a Subtitle D landfill

The costs associated with treatment and disposal at a RCRA permitted facility typically range from $150 to $400 per ton, excluding transportation costs and state taxes. The closest RCRA facility which would be able to handle a project of this magnitude is:

Peoria Disposal Company (PDC)
4700 North Sterling Avenue
Phoria, Illinois 61615-3647
- or -
P.O. Box 9071
Peoria, Illinois 61612-9071
(309) 688-0760

The estimated cost for the stabilization of the material at PDC's RCRA landfill is on a per ton basis. The cost will be increased if special handling is required, such as crushing or grinding large pieces of battery casing. PDC has indicated that this cost includes disposal in their RCRA landfill. PDC has, on occasion, shipped treated materials to their Subtitle D facility in Clinton, Illinois, however, they are not able to ship materials to facilities other than their own. The cost of treatment and disposal would not change if the Clinton landfill was to be used for disposal. Therefore, the second option listed above does not appear to be economically feasible.

Another viable option for disposal is the construction of an on-site stabilization unit. Under the National Contingency Plan, 40 CFR Section 300.400(e), no federal, state, or local permits are required for on-site response actions conducted under CERCLA. It is important to note, however, that ARARs may incorporate the requirements of most permitting programs.

An article published in the October 1991 issue of Pollution Engineering **(Attachment 2)** discusses various on-site treatment methods and incorporates data from a USEPA study on the costs of on-site stabilization. Although the USEPA data was collected in 1986, the costs appear to compare favorably with the costs of off-site treatment and disposal. The author notes, however, that fugitive dust, vapor, and odor generation must be taken into consideration when performing area mixing stabilization processes.

After the material is stabilized, it must be tested to verify that the concentration of leachable lead is below 5.0 mg/l. The material may then be disposed of in a Subtitle D landfill. The nearest Subtitle D facility which would be able to handle a project of this size is:

Waste Management
Chain of Rocks Recycling and Disposal Facility
P.O. Box 1367
Granite City, Illinois 62040
(618) 797-7876

The estimated cost for disposal of special wastes at the Chain of Rocks facility is $20 per ton, excluding transportation costs.

Estimates of construction and disposal costs are based on historical costs and WCC's experience. No warranty, expressed or implied is given by WCC as to the accuracy of the estimates provided.

nor has EPA had the time to address this issue. With the treatment of the Vision Ease waste to 5.0 mg/l as measured by the EP and the SLSA data demonstrating treatment to 4.82 mg/l as measured by the TCLP, and data points above the characteristic level submitted by the waste treatment industry, the Agency is adopting for nonwastewater forms of D008 wastes, the treatment standard equal to 5.0 mg/l as measured by the EP procedure. The Agency is adopting this approach to address the range of variability inherent in the D008 wastes.

Because a facility may generate a waste containing lead and other metals the TCLP (which is required for most other metals) may be used to measure compliance with this standard. EPA is not basing the standard for D008 on the TCLP, however, because that protocol is more aggressive for lead than the EP. The Agency is not sure that levels of 5.0 mg/l as measured by the TCLP are typically achievable. The TCLP can be used to demonstrate compliance. However, if the analysis shows that the waste leaches below 5.0 mg/l for lead as measured by the TCLP, then the facility has complied with the standard. If the waste leaches above 5.0 mg/l for lead, then the facility may analyze the sample using the EP procedure. (It should be noted, however, that if a waste exhibits the amended toxicity characteristic, it must still be managed in a Subtitle C facility even if it is not prohibited from land disposal).

(b) Wastewaters. In the November 22, 1989, proposed rule, the Agency proposed a treatment standard for D008 wastewaters of 0.04 mg/l based on a transfer of the performance of precipitation with lime and sulfide, filtration, and settling for K062 wastewaters. In addition, the Agency solicited comments on the approach of specifying a precipitant as a method of treatment for D008 wastewaters. Comments were solicited on whether the Agency should develop treatment standards based on data provided from the primary and secondary lead smelters industries as part of the Agency's effluent limitation guidelines program.

Many commenters questioned the Agency's technical capabilities of the transfer of the performance of the treatment system for K062 wastes as compared to D008 wastewaters. In particular, the commenters pointed out that the untreated K062 wastewaters had low concentration of lead compared to the D008 wastes as actually generated. However, commenters submitted additional data indicating that although the 0.04 mg/l for lead was unachievable, precipitation and filtration treatment could achieve concentrations of lead in the effluent lower than the characteristic level.

In particular, the Agency received treatment data for D008 wastewaters from three sources. One set of data submitted to the Agency was from the Battery Council, Inc (BCI). These data represented a small portion of the data that was collected in the effluent limitations guidelines program for the battery and nonferrous metals point source category. BCI's contention was that if the Agency decides to develop treatment standards lower than the characteristic level for D008 wastewaters, then the Agency should base the levels on the effluent guidelines for the battery and nonferrous metals categories. The Battery Council submitted treatment data using the following treatment technologies: lime settling, lime settling and filtration, and carbonate precipitation, settling, and filtration. This data showed influent concentration levels ranging up to 300 ppm. The data showed a substantial reduction of lead and other metals from the treatment system. BCI submitted corresponding quality assurance/quality control (QA/QC) information for the data. If the Agency uses the data from the treatment system, the calculated treatment standard would be roughly 0.6 mg/l, an order of magnitude lower than the characteristic level.

In addition, the Agency received D008 wastewater data from Tricil Environmental Services, a treater of D008 and other characteristically hazardous wastewaters. However, this waste was commingled with other waste before treatment, thereby blending down such that the concentration of lead would be lower than what was actually reported. Data was submitted on the treatment of lead by precipitation with phosphate, followed by settling, and filtration. The concentration of lead in the influent before blending down ranged up to 50,000 ppm. If the Agency used all of the treatment data in order to calculate a treatment standard, the performance of the treatment system indicates that a calculated treatment standard is 0.2 mg/l, which is more than an order of magnitude lower than the characteristic level. The Agency would hesitate to use the data in developing treatment standards for D008 wastewaters due to the lack of QA/QC data and corresponding influent and effluent data. Because of the initial concentration of lead and concentrations of other dissolved metal, the Agency believes that these wastes represent the variability associated with the characteristic wastes.

Also, the Agency received treatment data from a foundry facility treating D008 wastewater. This data represents treated wastewaters by precipitation with high magnesium lime and filtration. The lead concentration in the untreated wastewater ranged up to 278 mg/l. If the Agency used all of the treatment data, the calculated treatment standard is 0.4 mg/l, which is an order of magnitude lower than the characteristic level. For this data, the Agency evaluated the QA/QC data, the design and operating parameters, and corresponding influent concentrations.

Based on the evaluation of all of the wastewaters data received from comments, as well as the various Clean Water Act effluent limitation guidelines and pretreatment standards regulating lead (for example, the Combined Metals Data Base and regulations for primary lead, secondary lead and battery manufacturing), the Agency concludes that well designed and well operated treatment systems can achieve total concentrations of lead lower than the characteristic level. As explained in Section III.D, however, EPA has determined not to require hazardous wastewaters to be treated to levels less than the characteristic level in order to avoid significant and potentially environmentally counterproductive disruptions to the NPDES/pretreatment and UIC programs.

In addition, many commenters suggested that the Agency not specify a precipitant as a method of treatment for D008 wastewaters. Many commenters suggest that particular precipitants may perform better depending on the characteristics of the waste. For example, Tricil Environmental points out that phosphate is a superior precipitant than carbonate or sulfate because of the low solubility of lead phosphate. The Agency agrees with the commenters and is not promulgating a precipitant as a method of treatment. In fact, the Agency is promulgating the treatment standard at the characteristic level, thereby treaters and generators of D008 wastewaters may select any precipitant in order to meet the characteristic level.

(c) Lead Acid Batteries. For lead acid batteries, the Agency is promulgating a standard of "Thermal recovery of lead in secondary lead smelters (RELEAD)". (See § 268.42 Table 1 in today's rule for a detailed description of the technology standard referred to by the five letter technology code in the parentheses.) The Agency believes that virtually all of

START

Attachment 2

the treaters of lead acid batteries are using a recovery process.

Incidentally. the Agency notes that lead acid batteries themselves. when stored. are not considered to be land disposed because the battery is considered to be a container (see 40 CFR 264.314(d)(3)). Battery storage. however. typically is subject to the subpart J storage standards (relating to secure storage. secondary containment in some instances. and other requirements). See subpart G of part 266.

Other commenters questioned whether the slag or matte from recovery processes would need further treatment and whether these wastes should be placed in monofills. The residuals from the recovery process are a new treatability group (i.e. the residues are not lead acid batteries) and therefore their status as prohibited or nonprohibited is determined at the point the residues are generated. Such residues would thus only be prohibited and therefore require further treatment if they exhibit a characteristic. See discussion of inorganic debris in section III.A.3.a of today's rule.

(2) *P110. U144. U145. and U146 Wastes.* The Agency proposed wastewater treatment standards for lead for P110. U144. U145. U146 based on a transfer of the performance of precipitation with lime and sulfide. filtration. and settling for K062 wastewaters. While these U and P codes represent primarily organo-lead compounds and one may consider that the transfer from an inorganic lead to an organic lead is not feasible. no comments were received indicating the lack of achievability. The Agency's judgment is that the standard is technically feasible. Therefore. the Agency is promulgating a standards for lead in P110. U144. U145. U146 wastewaters of 0.04 mg/l as proposed.

The Agency has determined that some nonwastewater forms of lead wastes including P110. U144. U146. and some D008 wastes. would need to be incinerated prior to stabilization due to the presence of high concentrations of organics in order to achieve a treatment standard based on stabilization. This is primarily because the organics typically interfere with conventional stabilization processes (particularly at concentrations exceeding 1% TOC). The Agency has data on the incineration on organic wastes containing up to 1.000 mg/kg lead (such as K087 wastes) followed by stabilization of the ash. These data indicate that the proposed standard (i.e. 0.51 mg/l leachable lead) can be achieved for wastes that also contain significant concentrations of organics. provided the organics are destroyed by pretreatment. Lead acetate (U144) and lead subacetate (U146) are anticipated to be less difficult (or at least of similar difficulty) to treat than tetraethyl lead. The Agency is therefore promulgating the 0.04 mg/l standard for organo-lead compounds. P110. U144. and U146.

Additionally. the Agency received no comments on the feasibility of the transfer of lead in K062 wastewaters to lead phosphate U145. Therefore. the Agency will promulgate as proposed.

(3) *K069.* In today's rule. the Agency is promulgating treatment standards for K069 nonwastewaters in the Calcium Sulfate Subcategory. and for wastewater forms of K069. In addition. the Agency is revoking the no land disposal based on recycling as a treatment standard for the Non Calcium Sulfate Subcategory for K069 nonwastewaters and is promulgating "Thermal Recovery of Lead in Secondary Lead Smelters (RLEAD)". See § 268.42 Table 1 in today's rule for a detailed description of the technology standard referred to by the five letter technology code in the parentheses.

For K069 wastewaters. the Agency is promulgating treatment standards for cadmium and lead. For cadmium. the treatment standard is based on the performance of chemical precipitation with lime and sulfide and sludge dewatering for K062 wastes. For lead. the treatment standard is based on the performance of chemical precipitation with magnesium hydroxide followed by clarification and sludge dewatering for D008 wastewaters. This treatment data was submitted as part of the public comment period. The Agency believes that these wastewaters better represent a K069 wastewater due to the concentration of lead (i.e. up to 300 ppm). The Agency believes that the performance of both technologies can achieve the regulated concentration due to the fact that both precipitating agents are hydroxides.

BDAT for K069 nonwastewaters in the Calcium Sulfate Subcategory is stabilization. The Agency believes that there is only one generator of this waste and that this waste cannot be directly recycled to recover lead. The waste characterization data from the one generator indicated that this waste contains metal constituents such as cadmium and lead. The metal concentrations range up to 3300 ppm.

For the K069 nonwastewaters in the Calcium Sulfate Subcategory. the Agency is transferring the performance of stabilization of K061 to K069 nonwastewaters. This is a technically feasible transfer because the K061 waste is a more difficult waste to treat. In fact. the lead concentrations in K061 waste ranges up to 20.300 ppm thus. the performance of the treatment system can be legitimately transferred.

(4) *K100.* In today's rule. the Agency is promulgating treatment standards for wastewaters and nonwastewater forms of K100 wastes as proposed. For cadmium and total chromium in K100 wastewaters. treatment standards are based on a transfer of the performance of chromium reduction followed by lime and sulfide precipitation. and dewatering for K062 wastes. For lead in K100 wastewaters. treatment standard is based on the performance of chemical precipitation with magnesium hydroxide followed by clarification and sludge dewatering for D008 wastewaters. The Agency believes that both technologies can achieve the concentration of the regulated constituents due to the fact that both precipitating agents are hydroxides. For K100 nonwastewaters treatment standards are based on the transfer of the performance of stabilization for F006 wastes.

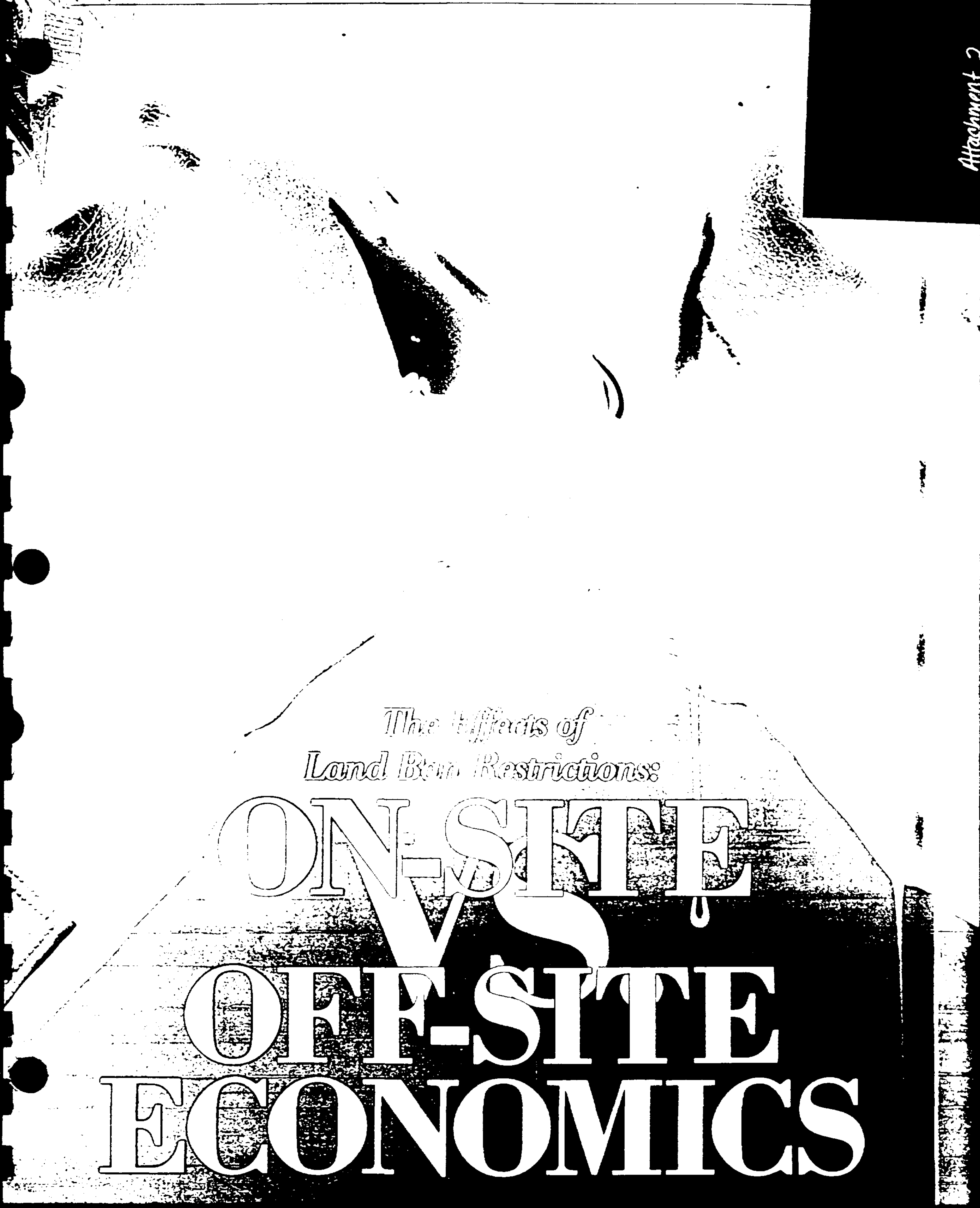
Treatment standards for K100 wastes were originally scheduled to be promulgated as part of the Third Third rulemaking. However. a treatment standard of "No Land Disposal Based on No Generation" for K100 nonwastewaters was promulgated on August 8. 1988 and subsequently revised on May 2. 1989 (54 FR 18836) to be applicable only to "Nonwastewater forms of these wastes generated by the process described in the listing description and disposed after August 17. 1988. and not generated in the course of treating wastewater forms of these wastes (Based on No Generation)." The Agency received no comments on the treatment standards for K100 wastes: therefore. the Agency is promulgating as proposed.

BDAT TREATMENT STANDARDS FOR D008

[Nonwastewaters]

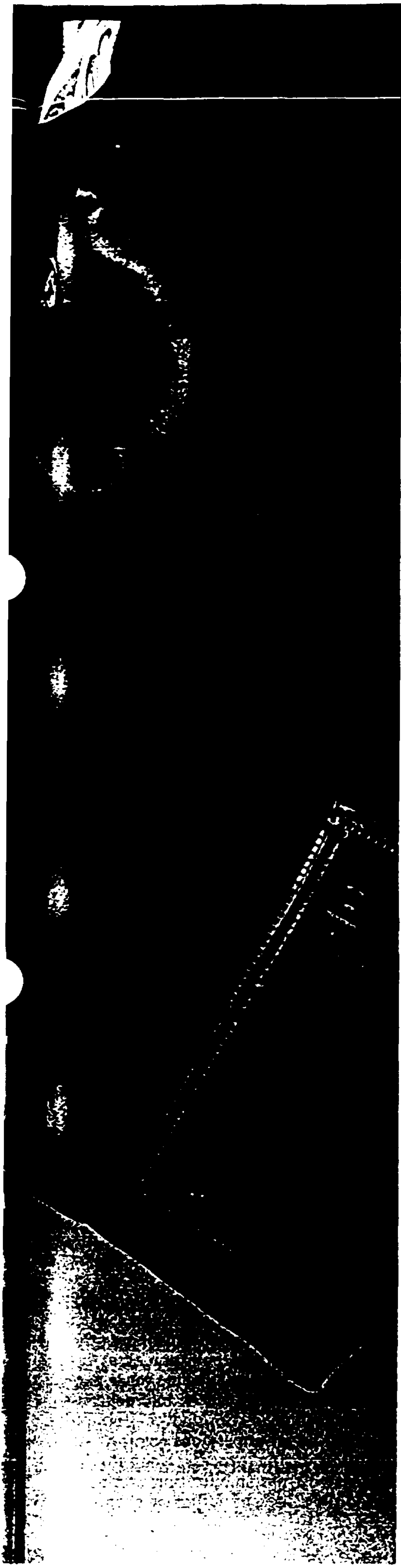
Regulated constituent	Maximum for any single grab sample EP (mg/l)
Lead	5.0

Attachment 2



The Effects of Land Ban Restrictions:

ON-SITE VS OFF-SITE ECONOMICS



The decision to treat hazardous waste on-site vs. off-site requires knowledge of the treatment methods and cost factors.

by Richard Donnachie

Land ban restrictions have had significant financial impact on the treatment of regulated wastes destined for secure landfills. The question of on-site vs. off-site treatment of Resource Conservation and Recovery Act (RCRA) regulated wastes is dependent on many variables that will ultimately affect the physical and chemical characteristics of the treated end product and the cost of obtaining this end product. Brought about in part by the land ban restrictions, these variables include:

- Regulatory constraints to on-site treatment.
- Initial quantity of waste to be treated and the degree of hazard involved in handling and treating the waste.
- Presence of interfering materials that can complicate the treatment process.
- Compatibility of wastes to be treated, which would affect mixing and consolidation of wastes.
- Availability of adequate technology and equipment to achieve satisfactory final results.

On March 29, 1990, the U.S. Environmental Protection Agency (EPA) promulgated the final Toxicity Characteristics (TC) Rule. This rule has three basic features: it replaces the Extraction Procedure (EP) with an "improved" Toxicity Characteristic Leaching Procedure (TCLP); it adds 25 organic chemicals to the current list of toxic constituents of concern; and it establishes regulatory levels for each of these new constituents on which hazardous waste determinations are to be made.

This rule expanded regulatory control over RCRA waste streams and facilities previously unregulated by the program. In addition, the modified TCLP test, put into effect Sept. 25, 1990, had a dual purpose: hazardous waste determinations and the evaluation of land disposal restricted hazardous waste with respect to their applicable treatment standards.

On May 8, 1990, EPA released the last of five rules issued under the 1984 RCRA amendments, which established treatment standards aimed at reducing the toxicity or migration potential of hazardous wastes prior to land disposal. According to EPA, nearly 25 million tons of the wastes affected by this rule are land disposed each year, of which four million tons are disposed in surface facilities and 21 million tons in underground injection wells.

When fully effective in May 1992, including the national capacity variance wastes, this rule and the previous

The pH of the waste strongly affects sorption/waste interactions.

four rules cumulatively are expected to mandate treatment of seven million tons of hazardous waste disposed of in RCRA-regulated surface facilities, and an additional 34 million tons of RCRA waste disposed of in underground injection wells. EPA estimates the total cost of complying with the rule will range from $350 million to $440 million per year, with the largest compliance costs predicted for the electric, gas, and sanitary service industries, the chemical and allied products industries, and the petroleum refining industries.

To understand the economics of on-site vs. off-site treatment of wastes to land ban criteria, it is necessary to understand the various treatment methods, equipment, and per ton cost estimates based on chemical characteristics of the waste stream.

Sorption

Sorption involves adding a solid to soak up any liquid present. The process may produce a soil-like material. Sorption generally is used to eliminate all free liquid. Non-reactive, non-biodegradable materials are most suitable for sorption, such as activated carbon, anhydrous sodium silicate, various forms of gypsum, celite, clays, expanded mica and zeolites. Some sorbents are pretreated to increase their activity toward specific contaminants and many are sold as proprietary additives in commercial processes.

Waste materials being considered for solidification/stabilization are usually liquids or sludges (semi-solids). To prevent the loss of drainable liquids and improve the handling characteristics of the waste, a dry, solid absorbent is generally added to the waste. The sorbent may interact chemically with the waste or may simply be wetted by the liquid part of the waste and retain the liquid as part of the capillary liquid.

The most common sorbents used with wastes include soil and waste products such as bottom ash, fly ash or kiln dust from cement and lime manufacturing. The pH of the waste strongly affects sorption/waste interactions. In general, selection of sorbent materials involves trade-offs among chemical effects, costs, amounts required to produce a solid product suitable for burial, and volume increase. Typically, when fly ash or kiln dust is used to absorb an oil sludge (50 percent oil, 20 percent water), a 2.5:1 ratio of sorbents is required.

Artificial materials can be used as sorbents in solidification, but the relatively high cost of these materials has prevented their widespread use. Synthetic materials have generally been used where binding of a specific contaminant in the waste is needed to meet land ban criteria.

Sorption of wastes requires only that the waste be mixed with the sorbent. This can be done with a mixing pit and a backhoe. More elaborate equipment such as a pug mill or ribbon blender can be used if better quality control is needed and if other pieces of materials handling equipment such as conveyors or pumps are available.

Solidification

Solidification implies the beneficial results of treatment are obtained primarily, but not necessarily exclusively, through the production of a solid block of material that has high structural integrity — a product often referred to as a monolith. The monolith can be as small as the contents of a steel drum, or encompass the entire waste disposal site, called a monofill. The contents do not necessarily interact chemically with the reagents, but are mechanically locked within a solidified matrix, called microencapsulation.

Contaminant loss is limited largely by decreasing the surface area exposed to the environment and/or isolating the contaminants from environmental influences by encapsulating the waste particles. Wastes also can be microencapsulated, that is, bonded to or surrounded by an impervious coating.

Solidification processes should be segregated from stabilization processes based on a lack of sufficient chemical

TABLE 1
COST-ESTIMATES FOR IN-DRUM TREATMENT

Note: Stabilization/solidification with 30% (w/w) Portland cement (Type I) and 2% sodium silicate of 40 gallons of waste (85 lb/cu ft) in 55-gallon drums at 4.5 drums per hour throughput.

Treatment reagents:					
30% Portland cement = 137 lb/drum × ($0.0275/lb) = $3.77/drum					
2% sodium silicate = 9 lb/drum × (0.10/lb) = 0.90/drum					
Total cost for 12,500 drums: $58,275					$4.67/drum
Labor cost for treatment:					
1 each Project supervisor = $27.50/hr = $6.11/drum					
2 each Laborers @ $12.50/hr = 25.00/hr = 5.55/drum					
Total labor cost for 12,500 drums: **$145,750**					$11.66/drum
Materials:					
Used, reconditioned drums: 12,500 for **$137,500**					$11.00/drum
Equipment rental:	**Capacity**	**Value**	**Per hour**	**Per drum**	
Chemical storage silo	2,000 cu yd	$20,000	$13.15	$2.92	
Change-can mixer	5 cu yd	15,000	9.90	2.20	
Forklift	1 ton	14,250	9.40	2.09	
Chemical feed system	100 lb/min	8,700	5.70	1.27	
Total rental for 12,500 drums: $106,000					$8.48/drum
Mobilization-demobilization and cleanup:					
10% add-on = $44,750					$3.58/drum
Total cost of treatment: 12,500 drums for **$492,275**					$39.36/drum
Profit and overhead (@ 30% of cost): $147,682					$11.81/drum
Total contracted price per drum:					$51.17/drum
Total contracted price for 12,500 drums (500,000 gallons or 2,850 tons of waste):					$639,957 or $224.29/ton

Reprinted from the *Handbook for Stabilization/Solidification of Hazardous Wastes*, U.S. EPA, 1986.

reaction to reduce the total metal or organic levels to acceptable TCLP standards.

Inorganic stabilization

Unlike solidification processes, which convert wastes into easily handled solids with reduced hazards from volatilization, leaching or spillage, refined stabilization processes reduce the solubility or chemical reactivity of a waste by changing its chemical state or physical entrapment. Stabilization processes usually include adjusting pH, converting metals to hydroxides, or oxidation-reduction conditions in the waste to prevent solubilization in groundwater using natural materials or synthetic ion exchange media. In hazardous waste disposal, an effort is usually made to have the waste delisted by passing EP or TCLP standards.

The most commonly used stabilization processes include mixing the waste product with inorganic materials such as fly ash, cement kiln dust, lime kiln dust, hydrated lime, Portland cement, and pozzolanic materials. These processes have extremely high success rates for the stabilization of metals to TCLP standards.

Pozzolanic materials are those that set to a solid mass when mixed with hydrated lime and water. Natural pozzolanic materials consist of volcanic lava or deposits of hydrated silicic acid of an organic origin such as diatomaceous earth. Artificial pozzolans are materials such as blast furnace slag, ground brick and some fly ashes from powdered coal furnaces. The common feature is the presence of silicic acid and frequently appreciable levels of aluminum oxides.

Pozzolanic processes are not good for all types of wastes. Common problems with lime pozzolan reactions involve interference with the cementitious reactions that prevent bonding of the materials. The bonds in pozzolan reactions depend on the formation of calcium silicate and aluminate hydroxates. A number of materials such as sodium borate, calcium sulfate, potassium bichromate and carbohydrates can interfere with this reaction. Oils and greases, solvents and other organic hydrocarbons also can physically interfere with the bonding by coating waste particles.

Stabilizing materials and their specific properties are as follows:

- *Fly ash.* Major constituents include silica and alumina. Fly ash has no natural neutralizing capabilities.
- *Cement kiln dust and Portland cement.* Major constituents include lime, silica, alumina and 4 percent to 8 percent free calcium oxide. These have medium natural neutralizing capacities.
- *Lime kiln dust.* Major constituents include lime and limestone and 40 percent to 45 percent free calcium oxide. Lime kiln dust has high natural neutralizing capacities.

Slag stabilization technology, often referred to as fixation, began in the early 1950s with bench testing and research conducted by the Tennessee Valley Authority for treatment of low-level nuclear wastes. The treatment media was water-quenched granulated iron blast furnace slag cement (GBFSC). Blast furnace slag by itself does not possess pozzolanic characteristics. When mixed in a formulation of 45 percent slag, 47 percent fly ash, and 8 percent Portland cement, it becomes a totally cementitious material with unique chemical characteristics and oxidation-reduction potential (ORP).

Treatment processes requiring reduction of chrome from $+6$ valence to $+3$, or in the case of technetium from a $+7$ valence to a $+4$ are enhanced with the GBFSC process. During treatment of 940,000 gallons of low-level radioactive waste at the Savannah River Defense Waste Processing Facility, the following results were obtained:

- Chrome level prior to treatment averaged 240 ppm; after treatment, 1 ppm.
- Technetium level prior to treatment averaged 75.3 micro curies of ionizing radiation per liter ($\mu Ci/L$); after treatment averaged $10\times$ reduction.

TABLE 2

COST ESTIMATES FOR IN SITU TREATMENT

Note: Stabilization/solidification with the 30% (w/w) Portland cement and 2% sodium silicate of a pumpable waste (85 lb/cu ft) from bulk tankers or drums mixed with a backhoe in an 8-ft-deep, 40-ft-diameter earthen mixing basin, and removed after 24 to 48 hr setting time. Total waste 500,000 gallons (2475 cu yd or 2850 tons) and production rate is 800 cu yd per 8-hr shift (4 days required).

Treatment reagents:

30% Portland cement	= 855 tons × ($55/ton) =	$47,025	
2% sodium silicate	= 57 tons × ($200/ton) =	$11,400	
Total cost of treatment reagents:		$58,425	20.50/ton

Labor cost for treatment:

1 each Project supervisor	= $27.50/hr × 32 hr =	$ 880	
2 each Heavy equip. operators @ $22	= 44.00/hr × 32 hr =	1,408	
1 each Laborer	= 12.50/hr × 32 hr =	400	
Total labor cost:		2,688	$0.94/ton
Expenses: @ $75/day for 4 men, 4 days		$1,200	$0.42/ton

Equipment rental:

	Capacity	Value	Per hour	Per 6 days	
Backhoe	(1.5 cu yd)	$95,000	$62/hr	= $2,976	
Front-end loader	(1 cu yd)	29,000	$20/hr	= 960	
Total rental cost:				$3,936	$1.38/ton

Mobilization-demobilization and cleanup:

Labor and expenses for 3 days: $2,016 + $900	= $2,916	
Transportation: 200 mile/trip × 4 trips × $2/mile	= 1,600	
Total	$4,516	$1.58/ton

Total cost of treatment:	500,000 gallons = $70,765	$24.83/ton
Profit and overhead:	(@ 30% of cost) = $21,230	$ 7.45/ton
Total contracted price:	500,000 gallons = $91,995	$32.28/ton

Reprinted from the *Handbook for Stabilization/Solidification of Hazardous Wastes.* U.S. EPA, 1986.

Thermoplastic microencapsulation is now being adapted to industrial and hazardous wastes.

Stabilization requires that all wastes are thoroughly mixed in a homogenous form to assure chemical characteristic integrity throughout the treated waste. Depending on the physical state of the waste, several different types of mixing equipment can be used.

Organic stabilization

Many proprietary formulations exist that offer varying degrees of effectiveness when stabilizing organic wastes. In general, wastes that lend themselves to treatment of organics are limited to petroleum hydrocarbon wastes. Another important consideration in stabilization of total petroleum hydrocarbon (TPH) wastes is the concentration. A recent EPA Applications Analysis Report has shown that the maximum concentration of TPH that can be successfully stabilized is 25 percent by volume.

A second study by EPA at the Douglasville, Pa., Superfund Site, under the Superfund Innovative Technology Evaluation (SITE) program concludes:

- The proprietary process can solidify contaminated materials high in TPH organics. Soils at the Douglasville Superfund site with up to 25 percent TPH organics were solidified. Case studies showed other successful solidification of petroleum refinery waste streams and other wastes high in organics.
- Organic contaminants, volatile organic compounds (VOCs) and base neutral/acid-extractable organics (BNA) were not immobilized for the most part. Instances where immobilization of organics occurred were observed in some case studies outside the SITE Program. In the SITE Program, the TCLP produced equivalent leachate concentrations for the treated and untreated wastes.
- Applications for immobilization of heavy metals in wastes containing high organics, even at organic levels higher than those of the SITE project are likely. Immobilization of organic contaminants in most applications is unlikely; some select applications may exist, and a treatability study should be performed for each.

Successful applications of stabilization (including immobilization organics) have been demonstrated at Risk Science International for The American Petroleum Institute (API), at the Sand Springs Superfund site in Oklahoma, and the International Technologies Study for the Industrial Waste Control Superfund site in Ft. Smith, Ark.

In the laboratory study performed by Risk Science International for API, a variety of refinery wastes were stabilized using a patented polymer solution, Chloranan, in a ratio of 1:30, with the addition of pozzolanic materials in a ratio of 3:1. In the API separator sludge, a 96 percent to 99 percent reduction was achieved in the leachate concentrations. This was true for all four chemical classes: VOCs, BNAs, acid organics and metals.

Physical and chemical tests (TCLP) after stabilization processes at the Sand Springs Superfund site provided similar positive results. The waste was a heavy organic tar, about 50 percent organics, with little volatile organics. After treatment, the only metals with TCLP leachate concentrations that could be quantified were barium and zinc. All other metals were below this limit. Accordingly, all volatile and semi-volatile organics were below the detection limit.

The most difficult of the three studies was performed for IT Corp. at the IWC Superfund site in Ft. Smith, Ark. The original site was a mixed waste disposal site placed on the National Priorities List (NPL) for high concentrations of metals and volatile organics. The site contained surface impoundments with hazardous sludge (metals and volatile organics, drummed solvent wastes, and large subsurface deposits of heavy

TABLE 3
COST ESTIMATES FOR MOBILE PLANT MIXING

Note: Stabilization/solidification with 30% (w/w) Portland cement and 2% sodium silicate of 500,000 gallons (2850 tons) of pumpable sludge (85 lb/cu ft) in a mobile mixing plant with daily throughput of 250 cu yd (10 days required). On-site disposal available.

Treatment reagents:					
30% Portland cement = 855 tons × ($55/ton)				= $47,025	
2% Sodium silicate = 57 tons × ($200/ton)				= $11,400	
Total cost of treatment reagents:				$58,425	$20.50/ton
Labor cost for treatment:					
1 each Project supervisor = $27.50/hr × 80 hr				= $2,200	
2 each Technicians @ $18.50 = 37.00/hr × 80 hr				= 2,960	
2 each Laborers @ 12.50 = 25.00/hr × 80 hr				= 2,000	
Total labor cost:				$7,160	$2.51/ton
Expenses: @ $75/day for 5 men, 10 days				= 3,750	$1.32/ton
Equipment rental:	**Capacity**	**Value**	**Per hour**	**Per 10 days**	
2 each Trash pumps	(6 in.)	$ 31,000	$ 20/hr	$ 1,600	
1 each Mobile plant		180,000	120/hr	9,600	
Total rental cost:				$11,200	$3.93/ton
Mobilization-demobilization and cleanup:					
Labor and expenses for 3 days: $2,148 + $1,125				= $3,273	
Transportation: 200 mile/trip × 2 trips × $2/mile				= 800	
Total:				$4,073	$1.43/ton
Total cost of treatment: 500,000 gallons				= $ 84,608	$29.69/ton
Profit and overhead: (@ 30% of cost)				= 25,382	$ 8.91/ton
Total contracted price: 500,000 gallons				= $110,000	$38.60/ton

Reprinted from the *Handbook for Stabilization/Solidification of Hazardous Wastes*, U.S. EPA, 1986.

metal sludges). The surface impoundment sludges contained 7 percent toluene, 2 percent trichloroethylene and 0.3 percent ethyl benzene. The composite drummed wastes contained 9 percent toluene and 4 percent methylene chloride. After treatment with a proprietary formulation at bench scale parameters, contaminants in general were below TCLP levels.

On the IWC job site, however, all treatment formulations were expanded to assure that final TCLP standards would be met. Prior to excavation and treatment of wastes, a 2100-linear-foot slurry wall was installed to prevent migration of contaminants off site, and a groundwater collection system was installed to fully encompass the seven-acre site. Drummed wastes were removed intact, and surface impoundments were dewatered and pretreated leaving a minimum of 12,000 cubic yards to be excavated and chemically stabilized. Of this material, 2000 cubic yards were stabilized in situ.

Thermoplastic microencapsulation, originally used in nuclear waste disposal, is now being adapted to special industrial and hazardous wastes. The technique for isolating the waste involves drying and dispersing it through a heated, plastic matrix, then allowing it to cool to form a rigid but deformable solid. In most cases, it is necessary to use a container such as a fiber or metal drum to give the material a convenient shape for transport. The most common material used for waste encapsulation is asphalt, but other materials, such as polyethylene, polypropylene or wax, can be used.

The major advantage of thermoplastic (asphalt) microencapsulation is its ability to solidify very soluble, toxic materials. This is a unique advantage that cement and pozzolan systems cannot claim. However, the process has severe organic stabilization limitations. Oils and greases tend to prevent the asphalt from hardening, and volatile organics such as xylene, toluene and benzene diffuse rapidly through asphalt.

Treatment process conclusions

Sorption processes and solidification processes have established success rates. Stabilization and fixation processes for inorganic wastes and heavy metal wastes also have proven performance, which establishes these processes as acceptable for land ban restricted wastes. Stabilization of organic materials has varying degrees of success. The stabilization of TPH organics up to 25 percent volume with inorganic materials and/or with the addition of patented or proprietary polymeric formulations, appears to be an acceptable process. However, it is solely dependent on the makeup of the original waste.

Wastes containing BNA or VOC organics do not have sufficient application data to confirm their application to all situations. Oxidation of toxic organic constituents using UV-ozone or chemical oxidizers can lower the toxicity of the final product. Of course, incineration ash or scrubber sludge residuals often require further treatment prior to disposal. The conclusion is that stabilization of organic wastes should be handled on a case-by-case basis.

On-site treatment

On-site treatment refers to treatment at the point of generation, storage or abandonment (Superfund sites). On-site treatment by the generator requires permitting by state and federal agencies such as Part A or Part B treatment permits. In the case of NPL or Superfund sites, permitting is not required if the treatment process is in accordance with

TABLE 4
COST ESTIMATES FOR MODULAR PLANT MIXING

Note: Stabilization/solidification with 30% (w/w) Portland cement and 2% sodium silicate of 500,000 gallons (2850 tons) of unpumpable sludge or solid waste (85 lb/cu ft) in a mobile mixing plant with daily throughput of 180 cu yd (14 days required). On-site disposal available.

Treatment reagents:					
30% Portland cement	= 855 tons × ($55/ton)		= $47,025		
2% sodium silicate	= 57 tons × ($200/ton)		= $11,400		
Total costs for treatment reagents:			$58,425		$20.50/ton
Labor cost for treatment:					
1 each Project supervisor		= $27.50/hr × 112 hr	= $ 3,080		
1 each Technician	@ $18.50 =	37.00/hr × 112 hr	= 2,072		
2 each Truck drivers	@ $15.00 =	30.00/hr × 112 hr	= 3,360		
2 each Laborers	@ $12.50 =	25.00/hr × 112 hr	= 4,928		
Total labor cost:			$13,440		$4.72/ton
Expenses: @ $75/day for 6 men, 14 days			= $ 6,300		$2.21/ton
Equipment rental:	**Capacity**	**Value**	**Per hour**	**Per 14 days**	
1 each Mobile plant		$125,000	$82.25 =	$ 9,212	
1 each Front-end loader	2 yd	44,000	29.40 =	3,293	
2 each Dump trucks	12 yd	54,000	33.60 =	3,987	
1 each Backhoe	1.2 yd	68,000	44.70 =	5,006	
Total rental cost:				$21,498	$7.54/ton
Mobilization-demobilization and cleanup:					
Labor and expenses for 4 days: $3,840 + $1,800			= $5,640		
Transportation: 200 mile/trip × 2 trips × $2/mile			= 800		
Total			$6,440		$2.26/ton
Total cost of treatment:	500,000 gal		= $106,103		$37.23/ton
Profit and overhead:	(@ 30% of cost)		= $ 31,831		$11.17/ton
Total contracted price:	500,000 gal		= $137,934		$48.40/ton

Reprinted from the *Handbook for Stabilization/Solidification of Hazardous Wastes*, U.S. EPA, 1986. (Editor's note: The mathematical errors in this table appeared in the original publication.)

In-drum mixing is best suited for highly toxic waste present in relatively small quantities.

the EPA Record of Decision (ROD). Exceptions are state-level potentially responsible party sites being remediated in accordance with a consent decree.

In addition to the acquisition cost of permitting, other factors such as the long-term liability associated with construction and maintenance of a facility, amortization of capital expenditures for processing equipment, and short- and long-term employee training and health care, also must be amortized in the unit price cost of on-site treatment.

According to the U.S. EPA publication, *Handbook for Stabilization/Solidification of Hazardous Wastes*, June 1986, a benchmark treatment cost analysis was performed for disposal of 500,000 gallons of hazardous liquid waste (metallic contamination). The waste was presupposed to have been suitably treated to remain on site after treatment and therefore no additional costs were to be incurred for transporting this material to an off-site location for final disposal.

The EPA report chose four separate treatment processes to compare the cost of a variety of available methods. In all four scenarios, the treatment material was an inert inorganic media that contained 30 percent Portland cement and 2 percent sodium silicate. The four alternate treatment processes were in-drum mixing, in situ mixing, mobile plant mixing of pumpable and non-pumpable wastes and area mixing.

TABLE 5
COST ESTIMATES FOR AREA MIXING

Note: Stabilization/solidification with 30% (w/w) Portland cement and 2% sodium silicate of 500,000 gallons (2850 tons) of high solids waste (85 lb/cu ft) in 12-in. lifts of waste to which a reagent layer is added and mixed with a high speed rotary mixer. Daily capacity is 250 cu yd (10 days required). On-site disposal available.

Treatment reagents:					
30% Portland cement = 855 tons × ($55/ton)			= $47,025		
2% sodium silicate = 57 tons × ($200/ton)			= $11,400		
Total cost of reagents:			$58,425		$20.50/ton
Labor cost for treatment:					
1 each Project supervisor	= $27.50/hr × 80 hr			= $ 2,200	
3 each Heavy equip. oper. @ $22	= 66.00/hr × 80 hr			= 5,280	
3 each Truck drivers @ $15	= 45.00/hr × 80 hr			= 3,600	
1 each Laborer	= 12.50/hr × 80 hr			= 1,000	
Total labor cost:				$12,080	$4.24/ton
Expenses: @ $75/day for 8 men, 10 days				= $ 6,000	$2.11/ton
Equipment rental:	**Capacity**	**Value**	**Per hour**	**Per 10 days**	
1 each Front-end loader	2 yd	$44,000	$29.40	$ 2,352	
1 each Dump truck	12 yd	27,000	17.80	1,424	
1 each Chemical spreader	8 ton	22,500	14.80	1,184	
1 each Rotary mixer	12 ft	36,000	23.70	1,896	
1 each Roller compactor	14 ton	28,000	18.75	1,500	
1 each Motor grader	14 ton	61,500	40.63	3,250	
Total rental cost:				$11,606	$4.07/ton
Mobilization-demobilization and cleanup:					
Labor and expenses for 1 day: $1,208 + $600			= $1,808		
Transportation: 200 mile/trip × 4 trips × $2/mile			= 1,600		
Total:			$3,408		$1.20/ton
Total cost of treatment:	500,000 gallons		= $91,519		$32.11/ton
Profit and overhead:	(@ 30% of cost)		= $27,456		$ 9.63/ton
Total contracted price:	500,000 gallons		= $118,975		$41.75/ton

Reprinted from the *Handbook for Stabilization/Solidification of Hazardous Wastes*. U.S. EPA, 1986.

Drum mixing

The first alternative, in-drum mixing, assumed the waste, 500,000 gallons, was in 55-gallon containers, each 75 percent full, or containing about 40 gallons (12,500 drums). This space remaining was to provide space for the stabilizing agents. In-drum mixing is best suited for highly toxic wastes present in relatively small quantities.

This technique also may be applicable when the waste is stored in drums of sufficient integrity to allow rehandling. This process requires specialized equipment with high maintenance cost, and is extremely labor intensive. The estimated production was 4.5 drums per hour. In-drum mixing is typically the highest cost alternative when compared to other bulk treatment methods, and it also poses unique problems in waste identification and treatment quality control. See Table 1.

In situ mixing

The second alternative, in situ mixing, is primarily suitable for closure of liquid or slurry holding ponds. In situ mixing is most applicable for adding large volumes of low-reactivity, solid chemicals, such as mixing stabilizing agents in a pond with a backhoe. Where applicable, in situ mixing is usually the lowest cost alternative. Quality control associated with in situ mixing technology is limited. See Table 2.

Mobile plant mixing

Mobile mixing plants can be adapted for liquids, slurries and solids. This technique is most suitable for application at sites with relatively large quantities of wastes to be treated. It gives best results in terms of quality control. Mobile mixing is applicable at sites where the waste holding area is too large to permit effective in situ mixing of the wastes or where wastes must be moved to their final disposal area.

Mobile plant mixing refers to those systems that incorporate mobile or fixed units to handle, meter and mix the solidification/stabilization agents and the wastes being treated. In this alternative, the wastes being treated are physically removed from their location; mechanically mixed using mixers, pug mills or augers with the solidification/stabilization reagents; and then redeposited in a prepared disposal site.

Plant mixing is primarily oriented toward treatment of pumpable liquids and high liquid content sludges. However, special equipment adaptations

An example of slag stabilization (fixation) is found in the Soliroc process. Patented in 21 European countries, this method of treatment was recently tested in the United States by an independent commercial waste treatment company and by the U.S. EPA Environmental Research Laboratory in Cincinnati, Ohio. This multi-phased process was tested on F006 plating wastes with several stages, including:

- *Stage 1.* Silica reagents (ground slags) are mixed with acid to produce monosilicic acid.
- *Stage 2.* The metal bearing waste is added.
- *Stage 3.* Alkalies are added to metal silicates causing them to polymerize and precipitate, generating a treated slurry.
- *Stage 4.* The final stage, fixation, was to solidify the slurry with the addition of granulated iron blast furnace slag cement (GBFSC).

Representative results (EP Toxicity test) were as follows:

- Cadmium was reduced from 950 ppm in the raw waste to 0.01 ppm with treatment.
- Chromium was reduced from 2640 ppm to 0.1 ppm.
- Zinc was reduced from 1130 ppm to a range of 0.05 to 0.07 ppm.

TABLE 6
STATES WITH RCRA PERMITTED LANDFILLS

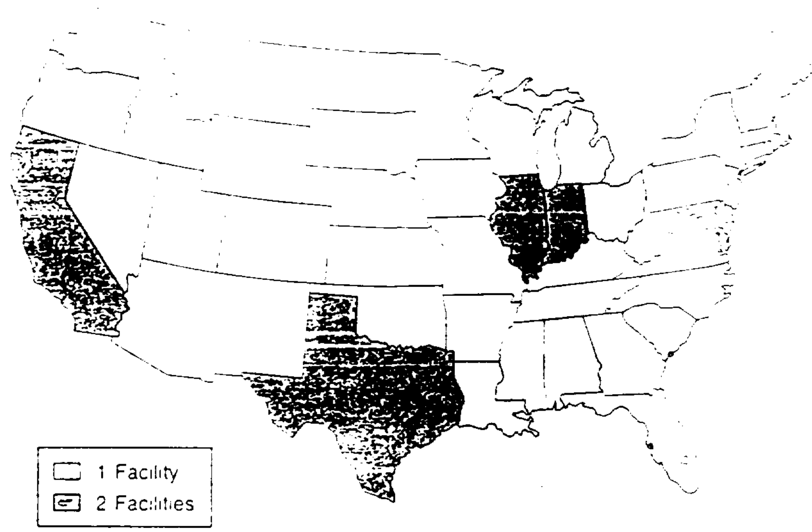


TABLE 7
REPRESENTATIVE OFF-SITE TREATMENT/STABILIZATION COSTS

State	Cost for bulk treatment	Cost for drum treatment
South Carolina	**$40.00/ton**	$120.00/drum
Alabama, Ohio, New York	**$60.00/ton**	$180.00/drum
Californina, Louisiana	**$80.00/ton**	$240.00/drum
Indiana	**$100.00/ton**	$300.00/drum

**Prices do not include transportation or state or federal taxes.*

have been used to handle sludges with high solids content and contaminated soils. During the EPA study, both pumpable and non-pumpable material estimates were prepared. See Tables 3 and 4.

Area mixing

Area mixing consists of spreading the waste and treatment reagents in alternating layers at the final disposal site and mixing them in place. This technique is applicable to those sites where high solids content slurries or contaminated soils must be treated. Area mixing requires the waste material be handled by construction equipment such as excavators, rotary sludge and soil stabilizers, and is not applicable to the treatment of liquids.

Area mixing presents the greatest possibilities for fugitive dust, organic vapor and odor generation control. Area mixing ranks below in-drum and plant mixing in terms of process quality control. See Table 5.

Off-site treatment

Off-site treatment for this research refers to treatment at a commercial RCRA Part B treatment facility. Treatment processes at these facilities usually include sorption, solidification, stabilization and fixation of the wastes to within land ban specifications. However, there are only 16 states that have RCRA permitted Subtitle C landfills. See Table 6.

Representative treatment/stabilization costs at off-site disposal facilities (RCRA Subtitle C landfills) to TCLP standards are presented in Table 7.

Richard Donnachie is with Laidlaw Environmental Services Inc, Poland, Ohio

Reader Interest Review
Please circle the appropriate number on the Reader Service Card to indicate your level of interest in this article
High **450** Medium **451** Low **452**

ATTACHMENT 3

PRELIMINARY BORROW VOLUME ESTIMATES AND SOURCES FOR THE PROPOSED RCRA-COMPLIANT CAP AND LINER

An estimate of the quantity of borrow materials required for the cap remedy recommended in the ROD has been completed. These estimates are included. Potential sources for the borrow material have been identified.

Type of Borrow Material Required

For the cap remedy, a two-foot thick layer of low-permeability clay soil is required, and a one-foot thick drainage layer. A two-foot thick topsoil layer is required to support the vegetative cover. EPA guidelines for a RCRA-compliant, multi-media cap were used to identify required soil types and thicknesses (EPA, 1989). These standards also meet the criteria of Part 724 of Title 35 of the Illinois Administrative Code, Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. In addition, a clay bottom liner is required for those areas outside the existing Taracorp pile that will become part of the final consolidated pile. We have assumed a thickness of three feet for this layer; this is the thickness required for the bottom liner of a RCRA-compliant landfill.

Based on the EPA guidelines, both the low-permeability clay layer of the cap and the bottom liner must have a saturated hydraulic conductivity of 1×10^{-7} cm/sec or less. The drainage layer of the cap must have a saturated hydraulic conductivity of 1×10^{-3} or greater. The guidelines also indicate a maximum allowable finished top slope of the landfill of five percent.

The EPA guidelines provide a set of general criteria for the low-permeability material. That is, if a clay soil meets the following criteria, the saturated hydraulic conductivity is probably 1×10^{-7} or less:

- Plasticity Index greater than 10 percent
- Percent passing No. 200 sieve greater or equal to 20 percent

- Percent retained on No. 4 less than 10 percent
- No pieces greater than 1 to 2 in. diameter.

For the drainage layer, any clean sand with less than about one or two percent passing the No. 200 sieve would meet the requirements. If the fine portion is silty rather than clayey, the percent passing No. 200 could be greater and the requirement would still be met.

Estimated Quantity of Borrow Materials Required

The materials that will make up the final consolidated pile are: the existing Taracorp pile, the piles at the SLLR site, and contaminated soil excavated and removed from adjacent areas. In residential areas, soil with lead content greater than 500 ppm will be excavated and added to the pile; in the Main Industrial Area the cut-off will be at 1,000 ppm lead.

According to the O'Brien and Gere Report of the Remedial Investigation (1988), the volumes of the Taracorp pile and the SLLR piles are 85,000 and 6,400 cubic yards, respectively. We have estimated the quantity of contaminated soil that will be added to the pile based the results of the PDFI:

- The quantity of soil to be removed from the Adjacent Residential Area is estimated to be approximately 97,000 cubic yards. This volume estimate was determined by calculating the unpaved area for each residential property within the study area, and then determining a volume for each lot based on the proposed remediation depths.

- The quantity of soil and fill to be removed from the Main Industrial Property is estimated to be approximately 35,000 cubic yards. This volume estimate assumes that 2 feet of material will require removal from the entire unpaved area of the Main Industrial Property.

Based on these estimates the combined total volume to be incorporated into the final reconfigured pile is estimated to be approximately 223,400 cubic yards. Assuming approximately 15 percent shrinkage due to compaction, the final volume of the reconfigured pile prior to installation of the RCRA cap is estimated to be approximately 203,600 cubic yards. Assuming that the BV&G Transportation and Rich Oil properties can be obtained and incorporated into the landfill, the reconfigured pile could have an approximate maximum volume of 354,000 cubic yards prior to capping.

Based on these estimated quantities and the geometric constraints of the pile, we have estimated the following borrow requirements:

- Low permeability cover - 36,400 cubic yards
- Drainage layer for cover - 18,900 cubic yards
- Topsoil layer for cover - 39,100 cubic yards
- Low permeability liner - 52,300 cubic yards

The estimates of the volume to be added to the pile do not take into account any material that will need to be added for stabilization of soil or fill classified as hazardous. This could potentially add a significant amount of material to the pile. Any excavated soil or fill material in excess of the maximum size of the pile will require disposal at an off-site facility.

Local Soil Conditions

Geologically, there are two general soil types in the area: the alluvial deposits of the Mississippi River, and the loess deposits of the bluffs a few miles to the east.

Based on Woodward-Clyde experience in the area, the loess deposits are a relatively uniform low-plastic silty clay soil, with a plasticity index (PI) generally greater than 10 percent, and otherwise meeting the EPA criteria. These soils are classified as the Fayette-Rozetta association by the U.S. Department of Agriculture Soil Conservation Service (SCS). According to the SCS *Soil Survey of Madison County, Illinois* (1986), the most common soil types developed on the loess bluffs are the Fayette, Rozetta, Sylvan, and Bold. The SCS data indicate that in the upper five ft of the soil profile, the Fayette and Rozetta soil types have a PI range of about 10-25 percent, and have about 95-100 percent passing the No. 200 sieve. The Sylvan and Bold soils, which are also common, are more variable, with a PI range of 3-30 percent indicated in the upper 5 ft of the profile. These loess deposits may be quite thick, up to about 40 ft; and because of their relative uniformity, the PI ranges are probably about the same at greater depths. This soil is locally referred to as "bluff dirt".

The alluvial deposits in the Mississippi River floodplain are highly variable, consisting of interbedded sands, silts, and clays. In general, the deposits tend to be sandier close to the main river channel and more clayey away from the river. The SCS maps show that Granite City and the surrounding area within about 3 to 5 miles lie in a soil association developed on sandy soils. Boring logs at and near the Taracorp site, presented in the O'Brien and Gere report, also indicate a generally sandy soil in the area. Farther to the east, closer to the edge of the floodplain, the maps show the Darwin soil association, developed on clayey alluvial deposits. These deposits generally consist of medium to high plastic clay and may be up to 20 feet or more in thickness. SCS data indicate a PI range of 25 to 55 percent in the upper five feet of the Darwin Soil, with 85 to 100 percent passing the No. 200 sieve. This soil is locally called "gumbo".

Potential Borrow Sources

There are a number of sand quarries in the Mississippi River floodplain in the vicinity of Granite City which could supply the material for the drainage layer. One of these, operated by Quality Sand, is located a few miles east of the site. The in-place sand has about four to eight percent passing the No. 200 sieve. The sand is washed to remove the fines, with the final product containing less than about one-tenth of one percent passing No. 200. According to their personnel, Quality Sand would have no problem supplying the quantity of sand required for the pile, from that quarry. Clay soils stripped from above the sand deposits at sand quarries have some potential for use as the low-permeability material. This would have to be evaluated case-by-case.

There are several excavation pits in the loess deposits along Illinois Route 157, which runs along the foot of the loess bluffs, several miles east of Granite City. These are generally small-scale operations, in which a farmer supplies local excavating contractors. Since each pit is fairly small, two or three of these may need to be employed to meet the requirements for the low-permeability material. The loess deposits are relatively easy to work and compact, and appear to generally meet the requirements of the EPA guidelines. However, they are highly erodible soils and may actually be marginal with respect to the hydraulic conductivity requirements.

The higher-plastic clay "gumbo" soil is also quarried locally. According to a local contractor who supplies Waste Management, Inc. with the gumbo soil for landfill liners, and who also supplied liner and cap material for two landfills at Granite City Steel, the gumbo soil is the only local soil that the IEPA will accept for the landfill liner and cap material. According to this contractor, there would be no problem getting the quantity of low-permeability clay required for this project from the clayey alluvial deposits (Darwin Soils) located a few miles east of Granite City.

Local sources that can supply a sufficient amount of borrow material for this project are:

Clay for Liner Material:

Garrett Excavating
2736 Saeger Road
Millstadt, IL 62260
618/337-5204

Sand for Drainage Layer:

Quality Sand
1327 North Bluff Road
Collinsville, IL 62234
618/346-1070

We have also considered the possibility of using subgrade soils from the SLLR site as borrow materials. Based on boring logs from the Taracorp site, the subsurface at the SLLR site probably consists of interbedded and variable sands, silts, and clays. At the Taracorp site, the general natural soil type appeared to be 50 percent or more sandy material. In addition, there was usually about four to six feet of miscellaneous fill material, which may also be present at the SLLR site. Without processing to remove the fines, the sandy soil would probably not be usable for the drainage layer. While the clay soil may be usable, the savings from hauling would have to be weighed against the cost of separating the material, and the cost of excavating material that would not be usable to get to the clay, and the cost to replace the excavated material. Therefore, the use of on-site soils as borrow material does not appear to be a viable option.

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QUALITY CONTROL SUMMARY REPORT

NL/TARACORP SUPERFUND SITE GRANITE CITY, ILLINOIS

Prepared for

U.S. Department of the Army
Corps of Engineers, Omaha District
Omaha, Nebraska

March, 1993

Woodward-Clyde

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WCC Project No. 89MC114V

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GLOSSARY OF PROJECT DEFINITIONS

The following definitions apply to terms commonly used in the text of this document:

Accuracy	Nearness of a measurement of the mean (x) of a set of measurements to the true value. Accuracy is evaluated by the percent recovery of sample spikes, analysis of laboratory control samples, and reference materials.
"Adjacent" Residential Areas	Residential areas that are contiguous with the NL Site.
α (Alpha)	The desired false positive rate for the statistical test to be used. The false positive rate for the statistical procedure is the probability that the sample area will be declared to be "clean" when it is actually "dirty."
Analytical Batch	The basic unit for analytical quality control is the analytical batch. The analytical batch is defined as samples which are analyzed together with the same method sequence and the same lots of reagents and with the manipulations common to each sample within the same time period or in continuous sequential time periods. (e.g., groundwater, surface water, soil, sediment, etc.
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
Batch	A group of samples which behave similarly with respect to the procedures being employed for those samples and which are being processed as a unit.

ß (Beta)	The false negative rate for the statistical procedure is the probability that the sample area will be declared to be "dirty" when it is actually "clean" and the true mean is P_1. The desired sample size is selected so that the statistical procedure has a false negative rate of ß at P_1.
BFB	Bromofluorobenzene
Calibration Blank	Usually an organic or aqueous solution that is as free of analyte as possible and prepared with the same volume of chemical reagents used in the preparation of the calibration standards and diluted to the appropriate volume with the same solvent (water or organic) used in the preparation of the calibration standard. The calibration blank is used to give the null reading for the instrument response versus concentration calibration curve.
CCB	Continuing Calibration Blank
CCC	Continuing Calibration Compounds
CCV	Continuing Calibration Verification Standard
CDAP	Chemical Data Acquisition Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHSO	Corporate Health and Safety Officer
CIH	Certified Industrial Hygienist
CLP	U.S. Environmental Protection Agency Contact Laboratory Program

COC	Chain of Custody
Co-Located Samples	Two or more separate samples taken from the same location, but not homogenized.
Comparability	A measure of the confidence with which one data set can be compared with another.
Completeness	A measure of the amount of valid sample data obtained from the measurement system compared to the amount of sample data that are analyzed. Valid results are those results which meet or exceed quality control criteria and satisfy quality assurance objectives.
CVAA	Cold Vapor Atomic Adsorption Spectrometry
DFTPP	Decalfuorotiphenyl-phosphine
DOT	Department of Transportation
DQCR	Daily Quality Control Report
DQO	Data Quality Objective
Duplicate	Duplicate samples are two samples taken and analyzed independently. In cases where aliquoting is impossible, as in the case of volatiles, co-located samples must be taken for the duplicate analysis.
ESE	Environmental Science and Engineering, Inc., analytical laboratory subcontractor
Environmental Samples	An environmental sample or field sample is a representative sample of any material (aqueous, nonaqueous, or multi-media) collected from any source for which determination of composition or contamination is requested or required.

EP TOX	Extraction Procedure Toxicity
FAA	Flame Atomic Absorption
Field Blanks	A sample matrix that is as free of analyte as possible and is transferred from one vessel to another at the sampling site using the sampling technique as closely as possible, including a typical holding time in the sampling equipment, and preserved with the appropriate reagents. This serves as a check on reagents and environmental contamination.
FOM	Field Operations Manager
FS	Feasibility Study
GC/MS	Gas Chromatography/Mass Spectrometry
GC/ECD	Gas Chromatography/Electron Capture Detection
GFAA	Graphite Furnace Atomic Adsorption
GPM	Gallons Per Minute
HAB	Hand Auger Boring
Homogenized	In the context of this CDAP, this is interpreted to mean as well mixed and uniform as reasonably possible.
HSA	Hollow Stem Auger
HSC	Health and Safety Coordinator
HSO	Health and Safety Officer
ICP	Inductively Coupled Argon Plasma Emission Spectrometry

ID	Identification
I.D.	Inner Diameter
IDPH	Illinois Department of Public Health
IEPA	Illinois Environmental Protection Agency
Main Industrial Properties	This consists of Taracorp, Trust 454, BV&G Transport, and Rich Oil Properties
Matrix Spike (MS)	A matrix spike is employed to provide a measure of accuracy for the method used in a given matrix. A matrix spike analysis consists of adding a predetermined quantity of stock solutions of certain analytes to a sample matrix prior to sample extraction/digestion and analysis. The concentration of the spike should be at the regulatory standard level, or the reporting limit for the method if the sample is free of the analyte.
Matrix Spike Duplicate (MSD)	A second matrix spike sample prepared identically to the matrix on which a duplicate analysis was performed to assess the reproducibility of the matrix spike analysis.
MCL	Maximum Contaminant Levels promulgated under the Safe Drinking Water Act.
Method Detection Limit (MDL)	The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

Method Blank	A sample matrix that is as free of analyte as possible and contains all the reagents in the same volume as used in the processing of the samples. The method blank must be carried throughout the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to monitor for possible contamination resulting from the preparation or processing of the sample.
NL Site	NL Site is for the National Lead/Taracorp Superfund Site which includes the industrial property, the residential areas, and remote fill locations.
NTU	Nephelometric Turbidity Units
OD	Outer Diameter
P	Cumulative Binomial Probability
PA	Program Administrator
P_0	The criterion for defining whether the sample area is clean or dirty. According to the attainment objectives, the sample area attains the cleanup standard if the proportion of the sample area with contaminant concentrations greater than the cleanup standard is less than P_0.
P_1	The value under the alternative hypothesis for which a specified false negative rate is to be controlled. Think of P_1 as the value less than P_0 ($P_1 < P_0$) that designates a very clean area that must, with great certainty, be designated clean by the statistical test.
PCB	Polychlorinated Biphenyl
PDFI	Pre-Design Field Investigation

Performance Evaluation Sample	A material of known composition that is analyzed concurrently with test samples during a measurement process. It is used to verify the performance of the analytical system. These samples are provided by the USACE during the laboratory validation process.
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts Per Million
Precision	Precision is the agreement between a set of replicate measurements without assumption or knowledge of the true value. Precision is evaluated as the relative percent difference or relative standard deviation for replicate or split samples.
PSPR	Plan for Satisfaction of Permitting Requirements
QAPP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
QCSR	Quality Control Summary Report
RAS	CLP Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
Remote Fill Areas	Locations where material from the Taracorp Pile has been used as fill material.
Reporting Limit	The reporting limit is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions as defined in the Laboratory QAPPs.

Representativeness	The degree to which a single measurement is indicative of the characteristics of a larger sample or area; or the degree to which data represents field conditions.
RI	Remedial Investigation
Rinsate	Usually reagent water that is as free of analyte as possible and is transported to the site, opened in the field, and poured over or through the sample collection device, collected in a sample container, and returned to the laboratory. This serves as a check on sampling device cleanliness and potential cross-contamination.
ROD	Record of Decision
RPD	Relative Percent Difference, calculated as

$$RPD\ (\%) = \frac{|R_1 - R_2|}{(R_1 + R_2)/2} \times 100$$

where R_1 = first sample value (original)
R_2 = second sample value (duplicate)

SAS	CLP Special Analytical Services
SLLR	St. Louis Lead Recyclers
SOP	Standard Operating Procedures
SPCC	System Performance Calibration Compounds
SSHP	Site Safety and Health Plan
SSO	Site Safety Officer

STS	Sample Tracking System
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
Trip Blank	A sample of reagent water that is as free of organic analyte as possible and is transported to the sampling site and returned to the laboratory without being opened. This services as a check on sample contamination originating from the container or sample transport.
USACE	US Army Corps of Engineers
USACE-MRD	USACE Missouri River Division Laboratory
USACE PM	USACE Project Manager
USC	Unified Soil Classification System
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WCC	Woodward-Clyde Consultants

DRAFT QUALITY CONTROL SUMMARY REPORT
NL/TARACORP SUPERFUND SITE PREDESIGN FIELD INVESTIGATION

1.0
PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Control Summary Report (QCSR) is the result of Work Order #0021 of Woodward-Clyde Consultants (WCC) Indefinite Delivery Contract with the U.S. Army Corps of Engineers, Omaha District (USACE), Contract No. DACW45-90-D-0008. Work Order #0021 consists of the pre-design field investigation (PDFI) for the NL/Taracorp Superfund Site, located in Madison County, Illinois.

The objective of the PDFI was to provide information for the design of the corrective remedial action for the NL/Taracorp Superfund Site (NL Site). To accomplish this, a variety of tasks were completed. These included an extensive field sampling program on both the industrial and surrounding Adjacent Residential Area. The goal of the field sampling program was to delineate areas where surficial soils will require excavation to achieve the cleanup levels established in the Record of Decision (ROD) for this site (500 ppm for the residential areas and 1,000 ppm for the Main Industrial Property).

Additional activities have been completed that are required prior to or concurrent with the initial stages of the remedial design. These activities include: identification of a RCRA-compliant landfill and associated disposal costs for contaminated material that cannot be disposed of on site; development of a Plan for Satisfaction of Permitting Requirements (PSPR) to include a list of permits required in conjunction with any remedial action; a scope of work for a treatability study; and a borrow evaluation to aid in the predesign of the RCRA cap for the reconfigured Taracorp pile.

The specific objectives of this site investigation included the following:

- Evaluate the horizontal and vertical extent of lead contamination in soil and of priority pollutants in groundwater beneath the NL/Taracorp/Trust 454 site.

- Evaluate the horizontal and vertical extent of lead contamination in soil in the Adjacent Residential Area.

- Determine the lateral and vertical extent of fill containing hard rubber battery casing material in the Remote Fill Areas identified by the USEPA.

- Estimate the volume of material requiring excavation and/or treatment in all the above areas.

- Determine possible sites from which suitable borrow material may be obtained to construct a RCRA-compliant cap for the Taracorp waste pile.

To accomplish these objectives, the following tasks were completed:

- Development of a Chemical Data Acquisition Plan (CDAP) for the PDFI to acquire information to estimate the quantities of contaminated soil to be excavated and treated for both on-site and off-site disposal.

- Development of a PSPR including a list of permits that will be required in conjunction with the remedial action, including the procedures and time frames required for acquisition of these permits.

- A voluntary interior visual inspection of residences within the site area to identify other potential sources of lead contamination. A total of 212 inspections were completed.

- Completion of all field activities and laboratory analytical work required for the PDFI, as outlined in the CDAP.

- Evaluation of potential borrow sites from which suitable material may be obtained to construct a RCRA-compliant cap to cover the Taracorp waste pile.

The use of on-site borrow was evaluated. The quantity of borrow needed for the cap has also been estimated.

- Construction of maps indicating the extent of remediation required for each residential decision unit. Maps were also produced which delineate the spacial extent of the hard rubber fill material that will require excavation, treatment and disposal.

- Potential disposal sites, alternatives, and limitations for disposal of the hard rubber battery casing material were identified.

- A Scope of Work for a treatability study for material classified as hazardous waste was developed.

1.2 BACKGROUND INFORMATION

This investigation concentrated on three principle areas: The Main Industrial Property (currently owned by Taracorp, Trust 454, BV&G Transport, and Rich Oil), the Adjacent Residential Area (Granite City and Madison), and the Remote Fill Areas containing hard rubber battery casing material from the Taracorp waste pile (Figures 1, 2 and 3).

1.2.1 Main Industrial Property

The Main Industrial Property consists of approximately 30 acres of property that is the location of a former secondary lead smelting facility (NL/Taracorp) and a battery recycling operation (St. Louis Lead Recyclers (SLLR) Trust 454), a trucking company (BV&G Transport), and a fuel oil distributor (Rich Oil). Two separate waste piles, the Taracorp pile and the SLLR pile, cover portions of the site. These have a combined volume of approximately 91,000 cubic yards. Approximately 80 percent of the material present is blast furnace slag (O'Brien & Gere,1988), with the remainder being a mixture of broken battery case material and lead oxide dust.

1.2.2 Adjacent Residential Area

The Adjacent Residential Area around the Main Industrial Property includes approximately 500 acres within the towns of Granite City and Madison, Illinois (**Figure 2**). The lead contamination present in the soil is primarily due to airborne particulate fallout from the secondary lead smelting operations.

1.2.3 Remote Fill Areas

A number of areas were identified where material containing hard rubber battery case material from the Taracorp waste pile was reportedly used as fill and paving material. These areas include Eagle Park Acres and Venice (south and southeast of Madison), three areas north of Granite City, and three areas within Granite City (**Figures 2** and **3**).

1.3 PREVIOUS INVESTIGATIONS

1.3.1 Remedial Investigation/Feasibility Study (RI/FS)

A Remedial Investigation at the NL Site was completed by O'Brien and Gere in September, 1988. A Feasibility Study (FS) documenting the formulation and evaluation of remedial alternatives for the site was completed by O'Brien and Gere in August, 1989.

1.3.2 Record Of Decision (ROD)

The ROD for the NL Site was issued on March 30, 1990. To adequately protect human health and the environment, the ROD requires the removal of all soils and battery casing materials with lead concentrations greater than 500 parts per million (ppm) in residential areas, and the removal of all soils and battery casing material with lead concentrations greater than 1000 ppm in the main industrial area. These areas would then be restored to their original state. All of the contaminated material that is excavated will be either incorporated into the main Taracorp waste pile or removed to a RCRA-compliant landfill, as appropriate. The enlarged and reconfigured Taracorp waste pile will then be covered with a RCRA-compliant cap to eliminate any potential for future exposure.

In addition, the ROD required that a voluntary inspection of the interior of each affected home be offered to residents as part of an effort to identify other potential sources of lead exposure. Based on these inspections a list of recommendations on ways to reduce exposure from indoor sources was provided to the residents.

1.3.3 Pre-Design Field Investigation (This Study)

The ROD requires removal of soil from the industrial and residential areas with lead concentrations greater than 1000 and 500 ppm, respectively. The soil sampling, analytical testing, and mapping efforts that were conducted as part of the PDFI attempted to delineate the levels and areal extent of the contamination in these areas. This report discusses the QA/QC activities that were conducted as part of the field investigation phase of the project.

2.0
PROJECT QUALITY OBJECTIVES

2.1 SITE INVESTIGATION OBJECTIVES

Additional information was required to proceed with the remedial design for the NL Site. Data was collected to better estimate quantities of material that will require excavation and possibly require treatment as required by the ROD (USEPA, 1990). The ROD requires that excavated material either be incorporated into the main Taracorp waste pile or be treated and disposed of in a RCRA-compliant or special waste landfill, as is appropriate for the source of the excavated material.

Specific objectives of this field investigation included the following:

- Estimation of the horizontal and vertical extent of lead contamination in soil in the Main Industrial Property
- Evaluation of the extent of groundwater contamination in the Main Industrial Property
- Estimation of the horizontal and vertical extent of lead contamination in soil in the Adjacent Residential Area
- Estimation of the lateral and vertical extent of fill containing hard rubber battery casing material in the Remote Fill Areas identified by the USEPA
- Estimation of the volume of material requiring excavation and/or treatment in all the above areas

2.2 DEVELOPMENT OF DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are defined as qualitative and quantitative statements which specify the quality of the data required to support decisions regarding remedial action.

DQOs are determined based on the end uses of the data to be collected and therefore, vary with each intended use. The following paragraphs describe the basis of DQOs for the PDFI at the NL Site.

2.2.1 Soil

2.2.1.1 <u>Data Uses</u>

The following were the intended uses of the data generated concerning surface and subsurface soils:

- To estimate the volumes of material requiring excavation as required by the ROD

- To estimate the quality of material requiring disposal in a RCRA-compliant landfill

- To evaluate potential sources of on-site borrow material from which a RCRA-compliant cap for the Taracorp pile could be constructed

2.2.1.2 <u>Data Generation</u>

The following activities were necessary to generate the appropriate data to fulfill soil information needs and intended uses:

- Site inspections
- Aerial photo/site map examinations
- Literature search
- Borings to allow sample collection
- Laboratory analysis for chemical parameters and physical testing

2.2.1.3 Data Needs

The following were general soil data needs that were identified for field investigations at the NL Site:

- An estimation of the extent of areas requiring removal and or treatment of soil
- An evaluation of soil characteristics including soil type, physical properties, and contaminant concentrations
- The collection of approximately 8,000 soil samples to make the necessary determinations required by the ROD and by the scope of services for this project

2.2.2 Geology

2.2.2.1 Data Uses

Geological data generated during the NL Site investigation was used for the following purposes:

- An evaluation of potential borrow material from which the RCRA-compliant cap for the Taracorp pile can be constructed (this material must have a hydraulic conductivity of less than 1 x 10^{-7} cm/sec)
- An evaluation of the influence of geologic characteristics on future remediation activities
- An evaluation of geologic characteristics in the area where the Taracorp pile will be expanded

2.2.2.2 Data Generation

The following activities provided geological and subsurface data for the NL Site:

- Compilation of detailed boring logs, soil characteristics, classification, and descriptions

- Particle size and sorting analyses on approximately 50 soil samples collected from the Main Industrial Property

2.2.2.3 Data Needs

The following geological data needs were identified for the intended data uses:

- An estimation of the continuity of near-surface stratigraphic units
- An estimation of particle size and sorting
- An evaluation of soil characteristics, classifications, and descriptions

2.2.3 Groundwater

2.2.3.1 Data Uses

Groundwater data that was collected during the NL Site field investigation will be used to estimate the degree to which groundwater quality has been adversely affected by surficial contamination and to estimate the downward mobility of the contaminants.

2.2.3.2 Data Generation

The following activities or types of data were necessary to fulfill data quality needs and uses for the groundwater data that was acquired during the NL Site field investigation:

- Installation of four additional monitoring wells
- Collection and analysis of water samples from both new and existing wells for priority pollutants (18 wells total)
- Aquifer permeability testing to evaluate aquifer parameters

2.2.3.3 Data Needs

The following groundwater data needs were identified for the intended uses:

- Evaluation of the in-situ permeability of the aquifer

- Establishment of contaminant levels present in the groundwater under the Main Industrial Property
- Identification of the depth to the water table

2.2.4 Residential Inspections

2.2.4.1 Data Uses

Information was collected to document other possible sources of lead exposure inside residential dwellings. Visual inspections were performed at each affected residence where the occupant requested such an inspection. This information was used to advise residents of other potential sources of lead exposure in their homes.

2.2.4.2 Data Generation

The visual inspections of home interiors generated the appropriate data to fulfill the data needs and intended uses of the residential inspection.

2.2.4.3 Data Needs

These visual home inspections attempted to identify potential interior sources of lead exposure.

3.0
FIELD ACTIVITIES

Review of the data presented in the RI/FS reports (O'Brien & Gere, 1988, 1989) for the NL Site indicated that additional information was required for remedial analysis and design. To estimate the quantities of material requiring excavation and treatment, additional information was required to define and document the horizontal and vertical extent of lead contamination in surficial soils. The following discussion outlines field activities conducted as part of the PDFI to collect the additional required data necessary to make these assessments.

3.1 SOIL SAMPLING PROGRAM

Environmental soil samples collected from the Main Industrial Property, the Adjacent Residential Area, and the Remote Fill Areas were analyzed for Total Lead (EPA method 3051/6010 or 7420), and/or the Toxicity Characteristic Leaching Procedure for Lead (TCLP-lead) (EPA method 1311/1310/6010 or 7420) in accordance with USEPA SW-846 guidelines and protocols (**Table 1**).

Environmental soil samples were delivered at the end of each workday by WCC personnel to Environmental Science and Engineering, Inc. (ESE) in St. Louis, Missouri, a USACE approved laboratory. All sample handling, documentation, and custody transfer were done in accordance with USEPA SW-846 chain-of-custody protocols. Additional samples were collected for Quality Control/Quality Assurance (QC/QA). The QC soil samples consisted of sample duplicates, and matrix spike/matrix spike duplicates. These samples were each collected at rates of 5 percent of the total number of samples collected, respectively, and were also analyzed by ESE. The QA samples consisted of sample duplicates. These samples were collected at a rate of 10 percent of the total number of samples taken and were analyzed by USACE's MRD Laboratory.

In addition, geotechnical soil samples were collected to determine the physical characteristics of the soils underlying the Main Industry Property. The geotechnical samples were analyzed by WCC's Clifton, New Jersey Laboratory. These geotechnical samples were tested for: grain size distribution, Atterberg limits, and moisture content.

Refer to **Tables 2** and **3** for the soil sample breakdown by location, depth interval, and collection frequency.

3.1.1 Main Industrial Property

As part of the PDFI, a soil sampling program was undertaken that would allow better definition of the areal and vertical extent of areas where lead concentrations exceeded the clean up standards of 1000 ppm established in the ROD.

Ten borings from the Trust 454 property, three borings from the BV & G Transport property, and two borings from the Rich Oil property for a total of 15 borings were drilled and sampled to better define the horizontal and vertical extent of lead contamination in excess of 1000 ppm. The activities consisted of the collection of 105 environmental and 78 geotechnical samples of surface and subsurface soils to a depth of 15 feet on the Main Industrial Property. Refer to **Figure 4** for boring locations.

Three additional borings were drilled and sampled on the Taracorp property. A total of 18 geotechnical soil samples were collected from these borings to determine physical characteristics and suitability of the on-site soil for use as a cap or liner material for the Taracorp pile.

3.1.2 Adjacent Residential Area

Soil sampling in the Adjacent Residential Area within the towns of Granite City and Madison, Illinois, was conducted from November 4, 1991 through December 9, 1991, and from March 2, 1992 through May 27, 1992 and from August 12 through August 13, 1992 (**Figure 2**). A hand augering apparatus was used to sample surface and subsurface soils to a depth of one foot. 5,011 soil samples were collected from the Adjacent Residential Area.

Soil sampling was conducted in the Adjacent Residential Area to determine the lateral and vertical extent of lead contamination in excess of 500 ppm. Two hand auger borings (HAB) were planned in each residential yard, with one in the front yard and one in the backyard. In instances where a large portion of the yard was tilled, covered with asphalt or concrete, or no front or back yard existed then only one boring was completed. Wherever possible, borings were placed at least 20 feet from any painted structures, and out from under trees or drain spout runoff areas. Boring locations were sketched in field logbooks or on pre-drawn 8½ X 11 inch plats of each residence (**PDFI Appendix K**). This information was later transferred to the 1 inch = 50 foot detailed maps of the Adjacent Residential Area.

One property that was sampled, 2317 Cleveland Avenue, is outside of the Adjacent Residential Area. The USEPA and USACE requested that WCC sample this location due to the resident's concern about the potential effects of lead contamination on his family's health.

3.1.3 Remote Fill Areas

In previous USEPA investigations and during the RI/FS public comment period, it was determined that the areas where hard rubber battery casing material from the Taracorp and SLLR piles was used for fill material were more extensive than presented in the RI/FS. The USEPA had identified this type of fill material in the following areas:

- Five (5) alleys in Venice
- Six (6) areas in Eagle Park Acres
- Missouri Avenue (old Ill. Rt. 3)
- Schaeffer Road
- Farmer's field near Sand Road
- 2230 Cleveland Avenue

During the course of the PDFI, several additional Remote Fill Areas were identified:

- 1628 Delmar Avenue
- 3108 Colgate Avenue
- 128 Roosevelt Street in Eagle Park Acres.

The location of these areas in relation to the NL Site is presented in **Figures 2 and 3**.

A total of 72 soil borings were drilled and completed in the Remote Fill Areas using both HAB's and a truck-mounted drill rig. Due to their variability, specific sampling programs were developed for each of the Remote Fill Areas. Descriptions of sampling locations for each of these areas follows.

<u>Venice Alleys</u> Five alleys in Venice, Illinois, have been documented by USEPA personnel to have fill material present containing rubber battery casing material that originated from the Taracorp/SLLR piles (**Figure 5**). A total of 20 borings were completed in the five alleys to delineate the vertical extent of the remote fill. To delineate the areal extent of the remote fill, a visual inspection was completed in each of the five alleys.

<u>Eagle Park Acres</u> A total of nine properties were sampled in the Eagle Park Acres subdivision (**Figure 6**). Eight of these were identified by USEPA prior to this investigation:

- 108 Carver
- 111 Carver
- 202A Harrison
- 203 Harrison
- 205 Harrison
- 100 Hill
- 203/205 Terry
- 208 Terry

The ninth property, 128 Roosevelt, was brought to the attention of WCC personnel by the residents of Eagle Park Acres. To estimate the areal extent of remote fill in each of the lots investigated in Eagle Park Acres, a visual inspection was completed at each of these properties.

<u>Missouri Avenue</u> At this location fill material from the Taracorp pile was used as paving material for parking areas for trucks and farm equipment. To determine the vertical extent of the remote fill material in several locations on this property, four HAB's and three drill rig borings were completed. A visual inspection was conducted to determine the areal extent of the fill material.

Other Remote Fill Areas Several other Remote Fill Areas were investigated. Two of these were north of Granite City in farmers' fields at Sand Road and Scheaffer Road. The other three areas were at residential locations within Granite City: 2230 Cleveland Avenue, 3108 Colgate Avenue, and 1628 Delmar Avenue. To determine the depth of remote fill, three HAB's were completed at Sand Road, Scheaffer Road, 2230 Cleveland Avenue, and 1628 Delmar Avenue; four HAB's were completed at 3108 Colgate Avenue. Visual inspections were completed at each property to determine the areal extent of the fill material.

3.2 GROUNDWATER INVESTIGATION

3.2.1 Monitoring Well Installation and Development

Four additional monitoring wells were installed in the area of the Main Industrial Property to better delineate the vertical extent of possible groundwater contamination (**Figure 4**). One well, MW-103-91 was installed in November, 1991. The other three wells, MW-104-92, MW-109-92, and MW-111-92, were installed during June, 1992. MW-104-92 was a replacement for MW-108-92. MW-111-92 was installed at 1628 Delmar Street, one half block north of the Taracorp property,. as a deep upgradient background well. MW-108-92 was drilled to a depth of 25 feet where petroleum residue was encountered at the top of groundwater. Soil and water samples were collected for laboratory analysis prior to abandoning the wellbore.

The four new wells were drilled and installed to depths of 69 feet to 72 feet (approximately 50 feet below the top of groundwater) to evaluate the possibility of any deep groundwater contamination.

3.2.2 Groundwater Sampling

Groundwater sampling was conducted from July 13 to 15, 1992, by WCC personnel. Twelve of the 18 monitoring wells were purged and sampled. Eight of those were pre-existing wells on or near the Taracorp property. The eight pre-existing wells were constructed of two inch I.D. PVC screens and risers, and were generally 25 to 35 feet in depth. The four two inch I.D. stainless steel, 70 feet deep wells installed by WCC, were also sampled. Four wells were dry and could not be sampled. The other two wells could not be sampled because the riser pipes at the surface were bent and damaged.

3.2.3 Permeability Testing

Aquifer permeability testing was performed on the four new monitoring wells installed by WCC at the NL Site on July 21, 1992. Slug testing was conducted by qualified WCC personnel to determine the in-situ hydraulic conductivity of the screened interval for each of the wells.

3.3 SAMPLE TRACKING SYSTEM (STS)

A computerized Sample Tracking System was utilized to organize and manage the sampling process. With the CDAP and QAPP as input, the Sample Tracking System was used to report holding times for each field collected, environmental sample by analysis, matrix, and location. The sample tracking system also specified the required number of QA/QC samples based on the numbers of samples collected to date and the QAPP sampling requirements.

The STS is a relational database management system allowing the Sampling Coordinator to perform queries on data. A unique sample ID, composed of the sample's matrix, location, depth, data, and type, allowed for easy sample tracking.

The STS allowed the Sample Custodian to track the samples from sampling request to receipt at the laboratory to receipt of the laboratory results. The STS was used to track holding times and the number of actual samples (sample, duplicate, field blank, matrix spike, and matrix spike duplicate) taken.

3.4 PROPERTY ACCESS DATABASE

At the request of USEPA and USACE, WCC provided assistance in identification and verification of residential property address information for properties to be sampled within the study area. This database was constructed based on information provided by USEPA, and the Granite City and Madison Tax Assessor's office.

The status of property access for soil sampling was included for each of the 1,595 properties listed in the final database. This information was used by USEPA to determine where follow-up contacts were needed. A summary of residential properties within the study area and their access status is included in PDFI Appendix F.

3.5 RESIDENTIAL HOME INSPECTION SURVEY

In the affected residential area, visual inspections of the interiors of residents homes were conducted to identify possible sources of lead exposure. The interior home surveys were voluntary, and appointments were scheduled at a time convenient for each resident. Resident names and addresses were provided by the USEPA. A visual inspection of the interior of each home was conducted under the direction of an EPA Certified Lead Paint Inspector and a Certified Industrial Hygienist. The inspection results were summarized and provided to the residents of each home after USEPA review.

A total of 212 interior home inspections were completed. Table 4 provides a summary of tasks conducted for the home inspection survey. PDFI Appendix J includes examples of contact letters, inspection forms, and summary letters.

3.6 HOME SURVEY TRACKING SYSTEM

WCC utilized a computer tracking system to assist with scheduling, management, and report generation of this task. The tracking system kept record of the following items:

- Resident name, address, and telephone number
- Landowner name, address, and telephone number if rental property
- Home inspection access
- Contact attempts - time, date, method, if contacted, by whom, and comments
- Appointment date - time, date, instructions for inspectors and by whom
- Inspection attempt completed

A detailed summary of this information for each resident has been included in the project file. Information for each resident includes:

- Home inspection appointment log form
- Home inspection survey form (if completed)
- Summary and recommendation letter (if completed)
- Detail report of survey tracking system

3.7 FIELD SURVEYS

3.7.1 Aerial Survey and Photogrametric Mapping

An aerial survey of the Main Industrial Property and Adjacent Residential Area of the NL Site was completed by WCC's contractor, Surdex, in August, 1991. The 1927 North American Datum State Plane was used as the ground control datum. The deliverable items were:

- Topographic map of the Main Industrial Property drawn at a scale of 1 inch = 30 feet with 1 foot contour interval on paper and in digital Intergraph format

- Planimetric map of the Adjacent Residential Area drawn at a scale of 1 inch = 50 feet on paper and in digital Intergraph format

- One 8-1/2 inch x 11 inch plat of each residential lot that was included in the original sampling plan **(PDFI Appendix K)**

- Aerial photographs taken during the August, 1991 aerial survey

All of the deliverables from these tasks were delivered to the USACE project manager at the conclusion of the project.

3.7.2 Ground Survey

The ground survey consisted of three parts:

- Field survey done by WCC personnel to locate HAB's

- Instrument surveying of soil borings in the Remote Fill Areas and Main Industrial Property and well locations

- Supplementary ground survey for the aerial survey to conduct the planimetric mapping

The majority of the field survey was completed by WCC personnel as part of the sampling documentation process. Each HAB was referenced to at least two fixed points on that lot. For vacant lots where reference points might be difficult to relocate in the future, HAB's were referenced to fixed points on neighboring lots. These measurements and the HAB locations were then depicted on the 8 1/2 inch x 11 inch plats.

For the monitoring wells and borings located in the Main Industrial Property and Remote Fill Areas, WCC personnel located the borings and well locations by placing a wooden stake and wooden lathe in the ground. All pertinent information was written on the lathe. The contract ground survey team used these markers to locate the borings and wells to be surveyed.

The survey of the monitoring wells and the borings located in the Main Industrial Property and Remote Fill Areas was conducted by L.G. Zambrana Consultants of St. Louis, Missouri. The locations of the soil borings and the monitoring wells were determined to the nearest foot. The elevations of the soil borings were determined to the nearest 0.1 foot. The elevations of the monitoring well risers were determined to the nearest 0.01 foot.

The supplementary ground survey for planimetric mapping was conducted by County Engineering of Warrenton, Missouri. Supplementary survey control included:

- Curb and gutter elevations
- Building corner elevations
- Manhole and drainage inlet locations and elevations

The final deliverables for both instrument surveys were:

- Survey field notes

- A plot of ground survey points
- A listing of the point's coordinates with respect to the 1927 North American Datum State Plane
- The survey plot in digital AutoCAD format on computer disk

The digital AutoCAD format allowed the ground survey information to be incorporated directly onto the 1 inch = 30 foot Main Industrial Property maps.

3.8 DEVIATIONS FROM THE SCOPE OF WORK

3.8.1 Soil Sampling

The final number of samples collected in the Adjacent Residential Area (soil) is substantially less than that specified in the Scope of Work and CDAP (9,570 samples).

There are several reasons for this:

- Only partial property access was obtained by USEPA, Region V in the residential areas. Access was only available for 898 out of 1595 properties.
- 54 properties were totally paved and/or cultivated and were not sampled as specified in the sampling procedures (SOP #1). This reduced the number of properties sampled to 844.
- An additional 62 properties were paved and/or cultivated in either the front or back yard such that only one of two HABs could be completed

One additional residential property at 2317 Cleveland Avenue, which is outside of the boundaries of the Adjacent Residential Area, was sampled at the request of USEPA and USACE. The resident here had asked USEPA to include his property in the study.

Additional Remote Fill Areas not specified in the Scope of Work of the CDAP were identified by WCC field personnel and sampled after consultation with USACE and USEPA. These properties were:

- 128 Roosevelt Avenue in Eagle Park Acres

- 3108 Colgate Avenue in Granite City
- 1628 Delmar Avenue in Granite City

3.8.2 Groundwater Sampling

Only 12 of the 18 monitoring wells that were to be sampled according to the Scope of Work and the CDAP were actually sampled.

MW-102, MW-105S, MW-106S, and MW-108S were dry, with screen settings at 20-25 feet. MW-103 and MW-105D were bent and damaged such that the wells could not be sampled.

4.0
SUMMARY OF A-E DAILY QUALITY CONTROL REPORTS

4.1 DURATION OF FIELD ACTIVITIES

Field activities were conducted during three phases for the PDFI at the NL Site. This was necessary due to the staggered receipt of property access which was obtained by USEPA - Region V. The first sampling phase began on November 1, 1991, and the last sampling task was completed on August 13, 1992. Duration of each field activity is included in **Table 5**.

4.2 WEATHER

Since field activities were conducted during the months of November, December, and March through August, a variety of weather conditions were encountered. Weather conditions which caused delay of field activities were:

- Rain
- Snow
- Temperatures below 32°F
- Temperatures above 85°F

When thunderstorms with rain and lighting were present, the drilling rig operations were stopped during the storm. For the hand auger boring (HAB) tasks, operations were stopped during down pours or freezing rain. When soil conditions were wet from the rain, the HAB sampling and decontamination tasks became more time consuming due to the adhesiveness of the soil on the hand augers and sampling equipment.

Snow covered conditions usually only delayed the starting time each day for field activities. Delays were usually related to adverse driving conditions for field crews commuting to the site. Occasional delays were caused by cold weather in conjunction with snow or freezing precipitation.

Soil sampling in temperatures below 32°F, presented a problem with decontamination of the sampling equipment, as well as the physical hazard presented by cold stress on field personnel. At temperatures below freezing, the decontamination water would freeze on the sampling equipment during the decontamination process. The spray nozzles on the hand pressurized pumps containing deionized water would also freeze. It was determined at a temperature below 25°F, it was impractical to properly decontaminate the sampling equipment. Sampling would cease until the temperature was above 25°F. The main hazard of cold stress among the field task members was possible frost bite to the fingers and toes. The documentation person was the most prone to this, because they could not write while wearing heavy gloves. To prevent frost bite, employees were supplied with cotton glove liners.

Conducting field activities above 85°F presented the possible problem of heat stress, especially when wearing Tyvek™ coveralls. Field task members were instructed to drink plenty of water and take frequent breaks. At high temperatures, the HAB sampling team switched from dark blue Tyvek™ coveralls to white Tyvek™ coveralls to reduce heat stress. For three-person HAB teams, the third person responsible for documentation and not involved in intrusive or decontamination activities was not required to wear a Tyvek to avoid heat stress.

Field activities which were stopped or delayed due to poor weather conditions are summarized by date and weather condition in **Table 6**.

4.3 SAMPLING SUMMARY

4.3.1 Main Industrial Property - Soil

A total of 105 analytical soil samples were collected from 15 borings. Samples were collected from the ground surface to a depth of 15 feet (**Table 7**). An additional 23 analytical soil samples were collected from four monitoring wells. These samples were collected from the ground surface to a depth of 25 feet. Total lead concentrations ranged from below detection limit of 6.5 mg/kg to 345,000 mg/kg (based on dry weight) (**PDFI Table 14**).

A total of 96 geotechnical soil samples were collected from 18 borings (**Table 8**). Samples were collected from the ground surface to a depth of 10 feet. Additional samples were collected from the screened interval of each of the four monitoring wells.

4.3.2 Adjacent Residential Area

A total of 5,011 soil samples were analyzed from the Adjacent Residential Area. Three depth intervals were sampled: 0 to 3 inches, 3 to 6 inches, and 6 to 12 inches. The range of total lead concentrations for these intervals were:

0 to 3 inches (Level A)	less than 5.1 to 14,800 mg/kg
3 to 6 inches (Level B)	less than 5.2 to 20,100 mg/kg
6 to 12 inches (Level C)	less than 5.6 to 14,500 mg/kg

In addition, ten samples with a broad range of lead concentrations were selected for TCLP-Lead analysis. The TCLP-Lead concentrations in these samples ranged from less than 0.13 to 48.6 mg/L. The Total Lead and TCLP-Lead results are presented in **PDFI Appendix G**.

4.3.3 Remote Fill Areas

A total of 84 soil samples for Total Lead and 52 for TCLP-Lead were analyzed from the Remote Fill Areas (**Table 10**). The range of Total Lead concentrations in these samples was 19.4 mg/kg to 68,400 mg/kg (**PDFI Tables 23** to **30**). The TCLP-Lead concentrations in these samples ranged from <0.11 mg/L to 440 mg/L.

For Venice Alleys, Missouri Avenue and Scheaffer Road only TCLP-Lead samples were taken. However, at Eagle Park Acres, Sand Road, 2230 Cleveland Avenue, 3108 Colgate Avenue, and 1628 Delmar Avenue samples for both Total Lead and TCLP-Lead were collected and analyzed.

4.3.4 Main Industrial Property - Groundwater

A total of 12 groundwater samples were collected from 12 monitoring wells. The wells sampled were: MW-101, MW-104, MW-106D, MW-107S, MW-107D, MW-108D, MW-

109, MW-110, MW-103-91, MW-104-92, MW-109-92, and MW-111-92 (**Figure 4**). Samples were analyzed for volatile organics, semivolatile organics, PCBs/pesticides, and metals. Six wells were either dry or damaged and could not be sampled.

4.4 FIELD PROBLEMS AND CORRECTIVE ACTIONS

Field corrective actions were taken if nonconformance with the established quality control procedures were identified. Any deviation identified from the quality control procedures were expeditiously corrected and documented. Quality control procedures were monitored by the Task Leaders, Field Operations Manager, and QA/QC Coordinator. Field task procedures that deviated from the standard operating procedures where corrective actions were taken are described below.

4.4.1 Soil Investigation

With the soil sampling task, several residential yards were not identified correctly and therefore the sample bottles were mislabeled. After obtaining more property information, the sample identification problems were identified and corrected. The sample bottles, log books, field data sheets, and sample tracking system were corrected. Resident identification numbers corrected were:

- OL1640 to OL1642
- GR2216 to GR2218
- DE2100 to MA2100
- DE1628, Boring 3 to OR00253, although lab results were reported with original ID Number
- DE1628, Boring 4 to OR00254, although lab results were reported with original ID Number
- IO0822200BL to IO0820200BL, sample container label only

For two samples within the Eagle Park Remote Fill Areas, a mistake was identified on the COC with type of analysis requested by WCC. For Sample ID No. STE0203100CT and STE0203100ABT, WCC had requested on COC Total Lead analysis but had meant to request

TCLP-Lead analysis. Upon identification of this mistake, ESE was instructed to conduct the TCLP-Lead analysis on these samples.

On December 4, 1991, 3 QA field duplicate soil samples were sent by accident to ESE instead of the USACE-MRD laboratory. The ESE's Sample Custodian identified the problem. The mistake was corrected by ESE shipping the preserved samples directly to USACE-MRD Laboratory. The sample ID numbers were:

- SMA0819100ALQ
- SMA0819100BLQ
- SMA0819100CLQ

Soil sampling problems encountered with the Adjacent Residential Area where sampling was not completed were:

- Property owner changed mind and would not allow sampling
- Either the property was tilled or covered with asphalt, concrete, or gravel
- Either the front or back yard did not exist or was tilled or covered with asphalt, concrete, or gravel; only one boring sampled
- Property was not sampled to all depth intervals, because of HAB refusal

Table 11 includes a list of the properties not sampled and the relative sampling problem.

4.4.2 Groundwater Investigation

Corrective action was taken during the development of Monitoring Well 103-91. After developing the well for two days and having problems obtaining stabilized water quality parameters, the Field Operations Manager identified in SOP No. 2 that a submersible pump should have been used instead of a centrifuge lift pump. The monitoring well task leader was notified, and the type of pump was switched immediately to complete development of the well.

During the installation and development of the monitoring wells, problems were encountered due to the geologic conditions. During installation of the four monitoring wells, the unconsolidated sands would heave inside the HSAs. This problem was corrected by adding clear tap water to the boring to develop a head pressure inside the HSAs which reduced the sand heaving. During development of the wells, problems were encountered due to fines within the well-graded sand formation. To develop the wells, the wells were pumped until the field parameters were stabilized and water quality was clear. For the final development of each well, the last five well volumes were bailed. Upon the final bailing, the water would again become turbid. After pumping and bailing each well for at least four hours and removing drilling fluid and at least 5 well volumes, USACE personnel were consulted. In consultation with USACE personnel it was decided that complete development could not be accomplished in a reasonable time frame and development was discontinued. For further information, refer to Section 2.2 in the PDFI Report.

For the installation of MW-109-92, problems were encountered with the bentonite pellet seal bridging at the centralizers within the HSAs. Upon the consultation with USACE, the well riser was pulled, the well redrilled, and the screen and riser re-set. The corrective action taken for the well installation was to use a bentonite slurry instead of pellets for the seal interval. The upper centralizer also was eliminated on the remaining two wells. No problems were encountered after this correction.

In the process of attempting to drill monitoring well MW-108-92, petroleum residue was encountered at the top of groundwater. Immediately upon observation of the petroleum residue, operations were ceased; the site was evacuated; and the Site Safety Officer, Project Manager, and USACE were contacted. After consultation with USACE, water samples were taken within the HSAs at the top of groundwater level. The boring was abandoned with cement slurry as specified in SOP #7 (CDAP). Appropriate air monitoring equipment was used during the sampling and abandonment of the boring.

For the groundwater sampling, six monitoring wells could not be sampled due to physical conditions. Four wells were dry which had screen settings at 20 to 25 feet below the top of riser. These wells were MW-102, MW-105S, MW-106S, and MW-108S. MW-103 and MW-105D were bent and damaged such that the wells could not be sampled.

For groundwater analysis, trip blanks labeled on the COCs were switched in the coolers sent to Ortek and USACE-MRD laboratories. The sample ID numbers labeled on the sample containers were taken as the correct sample ID number. The two trip blanks of concern were labeled as:

- WMW112-10GG0TB - Shipped to USACE - MRD Laboratory
- WMW113-10GG0TB - Shipped to Ortek Laboratory

4.5 QUALITY CONTROL ACTIVITIES

4.5.1 QA/QC Sampling Activities

To assess the quality of data resulting from the field sampling program, field duplicates and matrix spike and matrix spike duplicates were collected and submitted to the analytical laboratory. For the analytical soil sampling program, a total of 5,285 field samples were collected and analyzed **(Table 2)**. The quality control for these samples was 281 field duplicates, a 5 percent frequency, and 285 MS and 279 MSD; a 5 percent frequency **(Table 2)**. The laboratory quality control consisted of analyzing 324 laboratory control samples at a 6 percent frequency.

For quality assurance, field duplicates were collected and submitted to the U.S. Army Corps of Engineers Missouri River Division (MRD) laboratory in Omaha, Nebraska. 529 field duplicates, a 10 percent frequency, were collected for quality assurance and submitted to USACE-MRD laboratory.

For each soil sampling area, quality control and quality assurance samples collected and analyzed are listed in **Table 2.**

The quality control and quality assurance level of effort for the groundwater investigation consisted of collecting field duplicate, matrix spike and matrix spike duplicate, equipment rinsate blank, and trip blank samples. For a total of twelve field samples, two field duplicates, one MS/MSD, two equipment rinsate blanks and two trip blanks were collected and shipped to the Ortek laboratory for analysis **(Table 12)**. For the MS/MSD samples, the laboratory mistakenly analyzed these as a field duplicate and conducted MS/MSD analyses on other field and laboratory control samples (See Section 5.2). To tally the QC level of effort the field MS/MSD samples collected were considered as field duplicate samples (**Table 12**).

The quality assurance level of effort for the groundwater investigation consisted of collecting and submitting to USACE these samples:

- 2 Field duplicates
- 1 MS/MSD
- 1 Equipment rinsate blank
- 2 Trip blanks (Volatile Organics Only)

To assure quality control with decontamination of sampling equipment, besides collecting equipment rinsate blanks, one sample of the double deionized source water was analyzed for metals. Results are included in **PDFI Appendix A**.

4.5.2 Internal Field Quality Control Checks

Field quality control checks included the review of all field documentation by the Task Leader(s) or Field Operations Manager. In addition the Task Leader(s) conducted daily random spot checks of the field team(s) performance.

4.5.2.1 Soil Sampling Tasks

For the Hand Auger Boring (HAB) and drilling rig boring teams, the task leader or his or her designee conducted random spot checks and observed:

- Sampling procedures
- Decontamination procedures
- Health and safety procedures
- Field documentation
- Boring abandonment

Field data sheets, sample bottle labels, and chain-of-custody were checked on a daily basis for correctness and completeness prior to shipping the coolers to the laboratory. The quality control checks were performed by the Sample Tracking Task Leader or the Field Operations Manager.

The field documentation recorded in log books was checked for accuracy and completeness and was compared to the chain-of-custody and sampling ID summary log books by the Soil Sampling Task Leader or by his or her designee.

The individual residential maps (8½ x 11 inches) were checked for completeness and clarity by the Field Operations Manager.

4.5.2.2 Monitoring Well Installation and Development

For the installation and development of the monitoring wells, the task leader or his or her designee conducted random spot checks and observed:

- Sampling procedures
- Installation and development procedures
- Decontamination procedures
- Health and safety procedures
- Field documentation

The field log books were checked for clarity and completeness by the task leader.

4.5.2.3 Groundwater Sampling

For the groundwater sampling team, the task leader or his/her designee conducted random spot checks and observed:

- Sampling procedures
- Decontamination procedures
- Health and safety procedures
- Field documentation

Field data sheets, sample bottle labels, and chain-of-custody were checked on a daily basis for correctness and completeness prior to shipping the coolers to the laboratory. The quality control checks were performed by the Sample Tracking Task Leader or the Field Operations Manager.

The field documentation recorded in log books was checked for accuracy and completeness and was compared to the chain-of-custody and sampling ID summary log books by the Sampling Task Leader or by his or her designee.

4.5.2.4 Residential Home Inspection Survey

Inspection reports were checked on a daily basis for clarity and completeness by the Home Survey Task Leader. Internal quality control was performed by WCC personnel by accompanying the home inspectors during several home surveys throughout the project. Quality control checks included:

- Proper identification and communication between the surveyors and the residents
- Complete, consistent, and accurate visual inspection
- Professional conduct

4.5.3 Field Documentation

To ensure quality control, extensive documentation of all field activities was performed. Field documentation was sufficient to reconstruct the details of the sampling process without relying on the memories of the field team members. This documentation included the following items.

4.5.3.1 Sample Identification Codes

Each sample was assigned a unique sample identification number. The identification number consists of sample matrix code, street code, lot number, boring number, sample depth code, and sample type. All of the codes are listed in **Table 13** with their appropriate description. An example follows to demonstrate the operation of the sample identification:

SMP1629200B00L

S	Sample Matrix (In this case, the sample matrix is soil)
MP	Street Code (In this case, the sample location is on Maple Street)
1692	Lot Number (In this case, the sample was taken at lot/house number 1692.)
2	Boring Number (In this case, the sample was taken from the 2nd boring on the property)
00B	Sample Depth (In this case, the sample was taken between 3-6 inches from the boring indicated)
00L	Sample Type (In this case, the sample was analyzed for Total Lead)

4.5.3.2 Sample Collection Field Sheets

Sample collection field sheets were completed at the time that samples were collected. The field sheets contained pertinent information concerning location of the sampling site, date sampled, WCC sample number, sample matrix (soil or groundwater), time sampled, sampler's initials, description of the sample container, analysis requested, and type of sample preservation. Space was included for QA/QC data, the Federal Express airbill number, and the name and address of the analytical laboratory. The member of the field team responsible for documentation would fill in the time sampled, date shipped, and sign the form at the time of sampling.

4.5.3.3 Chain-of-Custody Procedures

Chain-of-custody (COC) protocols were followed in both the field and laboratory in order to properly document the possession and transfer of the samples from collection to storage, analysis, and disposal.

At the time of sample collection the COC form was completed for each sample. The sample identification number, sample date, sample time, size of sample container, analysis requested, sample preservation, and the sampler's signature were recorded on the COC form along with any pertinent remarks for the laboratory. Separate COC forms were completed for samples going to ESE, and for the samples going to the USACE-MRD laboratory for QA analysis. Corrections to the record were done with a single strike mark, dated, and initialed. All entries were in blue or black ink.

Upon return to the field office at the end of the day, the sample count was verified and each sample was checked against the COC record to ensure that sample numbers and sample times were correct. The person relinquishing custody of the samples then signed and dated the COC record. A Federal Express airbill was then completed for those samples sent to the USACE-MRD laboratory for QA/QC analysis. The airbill number was recorded on the COC record, and the COC record was then placed inside a Ziploc-type plastic bag and taped to the inside of the cooler lid. Samples going to ESE's laboratory were delivered by WCC field personnel. The COC record was signed and dated by the person relinquishing the samples and the person delivering the samples. The record was then placed in a Ziploc-type bag and taped to the inside lid of the cooler. Two custody seals were signed and dated. One seal was placed on each side of the cooler so that the cooler could not be opened without breaking the seals. The coolers were then securely closed using fiberglass strapping tape. A copy of the COC form was retained by the sampling team for the project file, and the original was sent with the samples. A copy of the Federal Express airbill was also retained as part of the documentation for the COC records.

4.5.3.4 Field Logbooks

Bound field logbooks were used to record field data, sample collection activities, pertinent observations and resident contacts. Field books were maintained for each field activity. The books contained sequentially numbered pages with an index at the front. Information in the index included the street address of each sample location and the page within the book on which the information could be found. At the beginning of each day the arrival time at the sample location was entered along with samplers names, type of personal protective equipment, and a brief summary of the weather. Each individual entry contained the property address, documentation of any contact with residents, a description of the location of each boring, sample numbers and sample collection times. HAB field books from the fall of 1991 included a sketch of the property showing the house, any garages or sheds, trees, gardens, paved areas, fences, and the boring locations. For HAB sampling conducted during the spring of 1992, 8 1/2 X 11 inch plats of each property were provided for recording this information. At the end of each day, a list of all SOP's followed during sampling activities were added along with the signature of the person recording the information. All entries were made in blue or black ink and any mistakes were crossed out with a single line, dated, and initialed. A similar fieldbook was maintained for activities relating to monitoring wells, industrial area borings and remote fill borings. Copies of COC's are included in the appropriate data report from the laboratory.

4.5.3.5 Boring and Well Logs

WCC personnel completed a soil boring log at the time of sampling for each boring completed by the truck mounted drill rig and for HAB's completed in Remote Fill Areas. Soil boring logs and well logs contained the project number and name, location, drilling contractor and driller, and type of drill rig. Starting date and time as well as completion date and time were included. A small sketch of the site indicating the boring location was included along with sizes and types of drilling and sampling equipment. Space was provided to show the quantities and types of samples sent to the laboratory for Total Lead, TCLP-Lead, or geotechnical analysis. The final disposition of the hole was also noted (backfilled, grouted, or monitoring well installation). The sample description noted on the log followed the USC classification system and the WCC format for continuous logging. Recovery and blow counts were included along with ATD groundwater information. Logs were signed by a WCC geologist or engineer. Boring logs are included in **PDFI Appendix C**.

4.5.3.6 Monitoring Well Installation Reports

Monitoring well installation reports were completed showing the well number, project name, project number, location, date, and installation method. A boring log was included along with a graphic description of the well. This graphic depiction included ground elevation, protective casing type, riser pipe type, pipe diameters, grouted seal material, and relative elevations. Filter pack and screen type, slot size, and relative elevations were included. Other information included the bottom of boring elevations, boring diameter, and total depth of hole. The well installation reports were signed by a WCC geologist or engineer. Well installation reports are included in **PDFI Appendix D**.

4.5.3.7 Monitoring Well Development Logs

Monitoring well development logs were completed for each of the four wells installed as part of this investigation. General information documented on these forms included: well number, project name, project number, date, well depth, water level, measuring point, well casing volume, and weather conditions. Sampling measurement included time, discharge, pumping water level (if measurable), water quality parameters, total discharge, casing volumes removed, and method of water disposal.

Quality assurance information that was documented included: sampling method, water level measurement method, whether bailer ropes were new or cleaned, water quality instrument calibrations, and any pertinent comments. The development logs were signed by the WCC geologist or engineer overseeing the development. The monitoring well development logs are included in **PDFI Appendix D**.

4.5.3.8 Home Inspection Survey Forms

A Home Interior Inspection Form was completed for each residence where an inspection was conducted. The form was set up in a checklist format. For each room inspected, the form required documentation of the paint condition, date the paint was last stripped and/or repainted, history of plumbing renovations, potential for lead pipes, and lead solder joints. For the overall house, the form required documentation of dust condition, furniture and carpet condition.

After completion of these forms by the home inspection teams, a QC review was completed by the WCC task leader.

4.5.3.9 Daily Quality Control Reports

At the end of each day Daily Quality Control Report (DQCR) forms were completed. The reports were compiled and sent to the USACE project manager (PM) weekly. The forms listed the USACE PM, project name, job number, date, day, and weather conditions. Other pertinent information included any sub-contractors on site, equipment used, a list of all work performed for the day, and the addresses of those properties that were sampled. The number of samples taken at each property was included and broken down into those samples that were for regular analysis and those that were for QA/QC. Any activities related to QC were described. Also included was a description of PPE levels, any problems encountered, and any corrective action that was taken. Work progress expectations for the next day were outlined, and the form was signed by the WCC employee.

4.6 HEALTH AND SAFETY ACTIVITIES

4.6.1 Personal Protective Equipment

Health and safety activities were performed in accordance with the Site Safety and Health Plan. Level of protection was dependent on the field activity. Non-intrusive activities were considered to be a low hazard. Personal Protective Equipment (PPE) for non-intrusive activities was either EPA Level "D" or street clothes. Non-intrusive activities conducted and corresponding level of protection were:

- Field mobilization/demobilization - street clothes
- Residential home inspection survey - street clothes
- Field Surveys - EPA Level "D"
- General support activities carried on outside of the exclusion zone - EPA Level "D"

Intrusive activities were considered to be a medium hazard. Personal protective equipment for all intrusive activities was EPA Modified Level "D". Intrusive activities conducted were:

- Soil sampling with hand augers
- Soil sampling with drilling rig
- Well installation and development
- Groundwater sampling and water level measurements
- Installation of permanent control monuments

For activities performed at EPA Level "D" the protective ensemble worn was:

- Hard hat (when working around heavy equipment)

- Safety glasses with side shields or goggles
- Coverall or Tyvek™ (optional)
- Work gloves (optional)
- Safety shoes or boots (Steel toed and shanked when working around heavy equipment)

For activities performed at EPA Modified Level "D" the protective ensemble worn was:

- Hard hat (when working around heavy equipment)
- Safety glasses with side shields or goggles (goggles and face shield for activities where splash hazard exists)
- Coverall, Tyvek™, or Rytex™ (navy blue, or white during temperatures > 80°F) taped at wrist and boot interface (Polycoated for activities where splash hazard exists) (If coverall, Tyvek™, or Rytex™ with elastic at wrist and ankle interface are used, no taping at wrist and boot interface is required).
- Undergloves, latex
- Outergloves, Neoprene (Nitrile for hand auger sampling)
- Overgloves, latex or vinyl (for hand auger sampling only)
- Boots, calf-high, Neoprene or PVC, steel toed and shanked

4.6.2 Site Safety Briefings

Prior to beginning any field task, a site safety briefing was conducted. Task members except for the home inspection survey were required to read the SSHP and provide verification that each person has had the OSHA 40-hr health and safety course, a respirator fit test, and a medical exam.

Site Safety briefings consisted of discussing these topics:

- Site description
- Chemical and physical hazards
- Personal protective equipment
- Action guidelines and personal air sampling monitoring
- Work zones

- Prohibited activities
- Emergency response and route to the hospital
- Visitor and resident communications
- Decontamination procedures

Site Safety briefings were conducted for these tasks on the corresponding date:

Task	Date
Hand Auger Boring Teams #1 & #2	11/01/91
Drilling Rig Team (Layne-Western)	11/15/91
Home Inspection Teams #1 & #2 (Occusafe, Inc.)	11/19/91
Ground Survey Team (Zambrana Consultants)	11/21/91
Hand Auger Boring Team #2	3/02/92
Home Inspection Team #1 (Occusafe, Inc.)	4/28/92
Drilling Rig Team (Layne-Western)	6/08/92

4.6.3 Personal Air Sampling Monitoring

Personnel engaged in intrusive field activities at the site were monitored to collect exposure data for inorganic lead. Dust exposure monitoring was performed using Gilian or SKC personal air sampling pumps (PASP). A minimum of two samples were collected by each task team during the first work day of intrusive activities. The intrusive activities monitored over an approximate eight hour work period were hand auger borings, drilling rig soil borings, and well installation. The PASP filters were then analyzed for total lead. PASP filter samples analyzed reported lead concentrations very near or below the reporting limits (**Table 14**). After results of the PASP filter samples were received, and it was verified that any health and safety risk was minimal; personal air sampling monitoring ceased.

4.6.4 Addendums to Site Safety and Health Plan

Due to changes in site conditions, two addendums to the Site Safety and Health Plan, dated 10/24/91, were made to further establish guidelines and requirements for the safety of personnel during field activities.

Addendum No. 1, dated 4/15/92, pertained to the HAB soil sampling task and installation of the intervisible permanent control monuments. For the HAB team, this addendum allowed the team member that documented the field activities be required only to wear PPE at EPA Level "D" versus Modified EPA Level "D". The addendum was enacted in the spring of the year to reduce heat stress among the team members. Addendum No. 1 is included as **PDFI Appendix I.**

The installation of the intervisible permanent control monuments was not included in the SSHP as an intrusive activity and was included in Addendum No. 1. PPE required for this task was EPA Modified Level "D". See **PDFI Appendix I** for further guidelines.

Addendum No. 2, dated 6/19/92, pertained to monitoring well installation and development and groundwater sampling. Upon drilling the boring for monitoring well MW108-92, petroleum products were detected at the top of groundwater. This addendum provided action levels and air monitoring guidelines for these tasks. A photoionization meter (HNu) was used for air monitoring during these tasks thereafter.

4.6.5 Medical Surveillance

WCC employees which conducted any field tasks during the PDFI were tested for blood lead levels. A baseline and exit test were performed for each employee. Subcontractor employees were given the option to have their blood lead levels tested. The blood test consisted of testing for zinc protoporphyrins and lead. Baseline and exit tests for WCC field personnel were normal.

4.6.6 Other

One change to the PPE equipment which was instituted on November 18, 1991, was to use vinyl surgical gloves over the outer (Nitrile) gloves during the HAB soil sample collection. This addition to the EPA Modified Level "D" PPE helped expedite the sampling task while preventing sample cross contamination. The outer surgical gloves were replaced after each HAB soil sample was collected. This eliminated the additional step of decontaminating the outer (Nitrile) gloves between samples, which required returning to the decontamination area after collecting each sample.

5.0
LABORATORY QUALITY CONTROL PROGRAM

5.1 QUALITY ASSURANCE OBJECTIVES

The overall Quality Assurance (QA) objective for the field investigation at the NL Site was to develop and implement procedures for sampling, laboratory analyses, field measurements, and reporting that provided a quality of data that was consistent with and adequate for the intended uses of that data. The sample set, chemical analytical results, and interpretations needed to be based on data that met or exceeded quality assurance objectives, established for the project. Quality assurance objectives for field measurement systems were also an important aspect of these investigations. These objectives for nonchemical data are discussed in the appropriate SOPs included in the CDAP. Field and laboratory analytical QA objectives are discussed in the following paragraphs.

Quality assurance objectives are usually expressed in terms of accuracy, precision, completeness, representativeness, and comparability. Target ranges for these parameters were established for analytical testing and field measurements prior to initiation of these activities. Any variances from the quality assurance objectives resulted in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data in the decision making process.

5.1.1 Level of Effort

5.1.1.1 Quality of (QC) Effort

Field duplicates and field blanks were collected and submitted to the analytical laboratory to provide a means to assess the quality of the data resulting from the field sampling program. Field duplicate samples were analyzed to check for sampling and laboratory reproducibility and representativeness. Equipment rinsate blank and trip blank samples were analyzed to check for procedural contamination and cross-contamination. These blanks were collected during the sampling effort. Matrix spike, matrix spike duplicate, and laboratory control samples were analyzed to assess that recoveries falling outside acceptance windows were attributable to sample matrix interferences and not to laboratory analytical errors.

The general level of this QC effort for the NL Site was a minimum of one field duplicate for every 20 investigative soil (5 percent) and one for every 10 groundwater samples (10 percent), and a minimum of one rinsate blank for every 10 investigative groundwater samples (10 percent). One matrix spike and one matrix spike duplicate sample were collected for every 20 soil samples (5 percent MS and 5 percent MSD), and for every 10 groundwater samples (10 percent). The specific level of field QC effort is summarized for each respective site in **Table 2**.

The level of QC effort provided by the laboratories was equivalent to the level of QC effort specified in USEPA SW-846, Third Edition, as described in the ESE Quality Assurance Program Plan (QAPP) (**CDAP Appendix B**) and the Ortek QAPP (**PDFI Appendix M**). The level of QC effort required for specific SW-846 analytical methods is summarized in **Table 15**.

The level of effort for the field measurements of pH, turbidity, and conductivity consisted of pre-measurement calibration and post-measurement verification, using standard reference solutions.

5.1.1.2 Quality Assurance (QA) Effort

Field duplicates and field blanks were collected for specific parameters and submitted to an independent government quality assurance laboratory. The USACE-MRD laboratory was used for this purpose. QA samples were taken at the rate of at least 10 percent of the total field samples collected. USACE personnel were also involved in general oversight of selected field activities as additional assurance of adherence to strict QA/QC protocol. The level of QA for each site is summarized in **Table 2**.

5.1.2 Measurement of Data Quality Objectives

5.1.2.1 Accuracy

Accuracy is the degree to which a measurement compares to an accepted reference or true value. An evaluation of the accuracy of a measurement system provides an estimate of bias. The accuracy of an analytical method was evaluated by analyzing known reference standards or spiking compounds.

The percent recovery achieved by analysis of known reference standards or spiking compounds was used to define the accuracy for the compounds of interest. The project goal was to analyze at least one known reference standard or matrix spike sample for every batch of 20 samples.

The accuracy goal for each parameter associated with sample matrix are listed in **Tables 16** and **17**. The accuracy goal for Total Lead and TCLP-Lead analysis in a soil matrix was 75 to 125 percent recovery.

The accuracy of field measurements of pH, turbidity, and conductivity were assessed through premeasurement calibrations and post-measurement verifications using standard solutions.

5.1.2.2 Precision

Precision is a measure of variability between individual sample measurements under prescribed conditions. Precision was assessed by replicate measurements of known standards and analysis of spiked duplicate environmental samples. Precision is calculated by a determination of the relative percent difference (RPD) of the duplicate samples.

Replicate measurements of known standards (laboratory control samples) are routinely monitored by the laboratory by comparing the RPD with established control limits.

The goal was to analyze one laboratory control sample and environmental matrix spike sample duplicate per batch of 20 samples.

Precision goals for each parameter associated with the sample matrix are defined in Tables 16 and 17. The precision goal for Total Lead and TCLP-Lead analyses is less than 20 relative percent difference (RPD).

5.1.2.3 Completeness

Completeness is defined as the percentage of the total analytical measurements which are judged to be valid in accordance with the QC criteria previously defined. The completeness goal was to generate a sufficient amount of valid data to support the NL Site field investigation objectives.

The data set must contain all QC analyses verifying precision and accuracy for the analytical protocol. In addition, all data were reviewed in terms of stated goals in order to assess the sufficiency of the data base. Completeness was calculated as the number of valid data points obtained divided by the critical data collected, multiplied by 100. The analytical completeness objective for the NL Site data was 80 percent.

5.1.2.4 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

Duplicate or co-located samples were collected and used as a means to assess field representativeness. By definition, duplicate samples are representative of a given point in space and time. Representativeness was also maintained during the sampling effort by sampling in compliance with the procedures described in Section 4.2 of the CDAP. Duplicate environmental samples were submitted from the field at a rate of one duplicate for every 20 environmental samples or per set collected.

5.1.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision as these quantities are measures of data reliability. Data are comparable if sampling considerations, collection techniques, measurement procedures, measurement methods, and reporting are equivalent for the samples within a sample set. A qualitative assessment of comparability will be made of applicable data sets.

5.2 DEVIATIONS FROM THE CDAP

5.2.1 Soil Analysis

Two deviations from laboratory methodology and procedures outlined in the CDAP were taken during the course of the project. Inconcurrence with the CDAP, laboratory methodology for analyzing Total Lead level in soil samples was SW-846 Method 6010. All soil samples collected in 1991 were analyzed by an ICP (Method 6010). Due to access related delays in the field activities, the contract laboratory, ESE, informed WCC that the continuing NL Site project would cause laboratory workload problems. To assure that the laboratory could keep pace with the sample load, approval by USACE was given to change the laboratory methodology to SW-846 Method 7420. All soil samples collected in 1992 were analyzed by the FAA, Method 7420.

For soil sampling conducted in 1991, field samples were taken for the environmental matrix spike and matrix spike duplicate samples. For each MS/MSD sample, three sample containers were filled with soil from the homogenized sample interval and labeled as the field sample, matrix spike sample, and matrix spike duplicate sample. At the same time as part of the laboratory QC level of effort, the laboratory was conducting MS/MSD analyses on every twentieth sample. The ESE laboratory informed WCC that the normal four ounce sample size was large enough to conduct both Total Lead and MS/MSD analyses, and the extra sample containers were not needed. It was easier for the laboratory to select every twentieth sample instead of WCC trying to track the twentieth sample in the field. To not duplicate effort, the additional task of collecting separate sample containers for MS/ MSD analysis was discontinued. The extra samples collected during the first period were considered as field duplicates and are included in the QC level of effort **(Table 2)**. These samples in the analytical data are identified by the last three digits of the sample ID # labeled as 0XM or 0XX **(Table 13)**.

5.2.2 Groundwater Analysis

Two deviations from laboratory methodology and procedures outlined in the CDAP were taken during the groundwater analysis. One deviation from the CDAP was the use of laboratory control samples for certain methods in the environmental matrix spike and matrix spike duplicate (MS/MSD) analyses. For the semivolatile and PCB's and pesticides analyses, the laboratory control (method blank) sample was used for the MS/MSD analysis. This deviation should not present a problem with validating the data, because the surrogate spike recovery analysis is the primary data validation qualifier. If there was matrix interference with the environmental sample, it would first be detected in the surrogate spike analysis and second in the MS/MSD analysis.

Due to miscommunication between the contract laboratory (Ortek) and WCC, the samples collected from MW-103-91 for the environmental MS/MSD analysis were considered as field duplicates and are included in the QC level of effort (**Table 12**).

The other deviation was the pesticide surrogate constituent was switched from dibutylchlorendate to tetrachloro-m-xylene and one PCB/pesticide matrix spike constituent was not tested, Aroclor 1254 (**Table 17**).

6.0
QUALITY CONTROL RESULTS

6.1 SOIL ANALYSIS

Soil samples collected from the NL Site were analyzed for total lead concentration and select soil samples were analyzed for TCLP - Lead. All soil samples and QC samples were analyzed by ESE, in St. Louis, Missouri. Data quality objectives were measured in terms of accuracy, precision, completeness, representativeness, and comparability.

6.1.1 Accuracy and Precision

6.1.1.1 Standard Laboratory Control Samples

Laboratory accuracy was measured by assessing the percent recovery of lead from standard laboratory control samples. The laboratory control sample consists of a clean matrix which is spiked with a known quantity of reference standard. Percent recovery was compared to control limits established under SW-846 guidelines. For Total Lead analysis, the percent recovery control limits are 75 to 125 percent. Analysis of laboratory control samples was performed on 314 samples (**Table 2**). 95 percent of the matrix spike analyses were within the percent recovery control limits. For TCLP-Lead analysis, the percent recovery control limits are 75 to 125 percent. Analysis of standard laboratory control samples was performed on 10 samples (**Table 2**). 100 percent were within the target range.

6.1.1.2 Matrix Spike and Matrix Spike Duplicates

Laboratory accuracy was measured by the percent recovery of a reference standard spike in the environmental sample. For Total Lead and TCLP-Lead analyses, the percent recovery control limits are 75 to 125 percent. For Total Lead, matrix spike analysis was performed on 267 samples (**Table 2**). 72 percent of the matrix spike analyses were within the percent recovery control limits. For TCLP-Lead analysis, matrix spike analysis was performed on 18 samples (**Table 2**). 93 percent were within the target range.

The laboratory precision was measured by the RPD between the environmental matrix spike and matrix spike duplicate samples. The precision control limit for Total Lead and TCLP-Lead analyses was less than 20 percent RPD. For Total Lead analysis, matrix spike and matrix spike duplicate analysis was performed on 267 samples (**Table 2**). 75 percent were within the precision control limit. Majority of the samples that were out of control were attributable to soil inhomogeneity or matrix interference. For TCLP-Lead analysis, matrix spike and matrix spike duplicate analysis was performed on 12 samples (**Table 2**). 100 percent were within the target range of 20 percent RPD.

6.1.2 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, or an environmental condition. Field duplicate and laboratory control samples were collected and analyzed to assess representativeness.

For Total Lead analysis, 277 field duplicate samples, representing a 5 percent frequency of total samples, were collected and analyzed (**Table 2**). For TCLP-Lead analysis, 4 field duplicate samples, representing 6 percent frequency of total samples were collected and analyzed (**Table 2**). In general, the data generated by the analysis of field duplicates was consistent with that of the corresponding samples.

Laboratory control samples and method blanks were taken by ESE laboratory for each batch of samples. The method blanks were carried through all steps of the analytical procedure and were used to measure any possible contamination.

6.1.3 Completeness and Comparability

6.1.3.1 Completeness of Analyses

Completeness is defined as the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The completeness goal percent was set at 80 percent to generate a sufficient amount of valid data to support the NL Site field investigation objectives. The valid data set contains all QC analyses verifying precision and accuracy for the analytical protocol. In addition, all data were reviewed in terms of stated goals in order to assess the sufficiency of the data base.

Completeness for the Total Lead and TCLP-Lead soil analyses was 100 percent (**Table 18**).

6.1.3.2 Laboratory Sample Handling

The following information pertaining to laboratory sample handling was taken from ESE's QAPP (**CDAP Appendix B**). When sample coolers arrived at the laboratory, samples were checked in by the Sample Control Officer or designee using the Cooler Receipt Form. All samples contained in the shipment were compared to the chain-of-custody record to assure that all samples designated on the chain-of-custody were received. Any changes in custody from the original custodian were noted.

Samples were placed in appropriate storage areas, and the chemists were notified. Access to samples was limited to authorized personnel, and a sample check-out list was maintained. An internal chain-of-custody record was started for the samples at the time they were removed from storage for processing and/or analysis. Samples remained in cold storage until data validation by WCC was complete. Upon disposal, the transfer of the samples was noted on the chain-of-custody record.

6.1.3.3 Sample Holding Time Nonconformances

The sample holding time requirements for lead analysis of soil is six months. Sample holding times for each sample were tracked with the sample tracking system. For the NL Site PDFI, all soil analyses for Total Lead and TCLP-Lead were completed and validated within six months. All sample holding times were in conformance.

6.1.3.4 Reporting Limits and Sample Dilutions

Sensitivity of analytical testing is determined by the reporting limits shown in **Table 19**. These reporting limits were achieved for majority of the analytical soil samples. Samples with higher reporting limits were samples with high concentration levels that were not within the calibration range of the analytical equipment. Sample dilution was required prior to analysis which raises the reporting limit by a factor of the dilution amount.

6.1.3.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability was assured through the use of a single laboratory for the soil analysis that uses established and approved analytical methods, standard operating protocols, and a laboratory quality control program. The laboratory quality control program was designed to establish consistency of methodology and comparability to other laboratory results by including measurements of independent reference materials.

6.2 GROUNDWATER ANALYSIS

Groundwater samples collected from the monitoring wells for the NL Site were analyzed for priority pollutants consisting of these chemical groups:

- Volatile Organics
- Semivolatile Organics
- PCBs and Pesticides
- Metals

All groundwater samples and QC sample analyses were conducted by Ortek Environmental Laboratory in Green Bay, Wisconsin. Individual constituents tested for are listed in Table 19, and the laboratory data is included in PDFI Appendix B. Data quality objectives were measured in terms of accuracy, precision, completeness, representativeness, and comparability.

6.2.1 Accuracy and Precision

6.2.1.1 Standard Laboratory Control Samples

Organics

Laboratory accuracy was determined by the recovery of compounds of interest from standard laboratory control samples. The laboratory control samples consisted of a clean matrix which were spiked with a known quantity of the surrogate analytes. Percent recovery was compared to control limits established under SW-846 guidelines. The percent recovery of surrogate spikes in laboratory control samples is discussed in the next section.

Metals

Laboratory accuracy for the metals analysis was determined by the recovery of constituents of concern for standard laboratory control samples. For the SW-846 methods using the graphite furnace or cold vapor atomic absorption (GFAA or CVAA), laboratory control samples were spiked with five constituents of concern per the 16 field samples. Percent recovery for all tests were within the control limits of 80 to 120 percent. For the inductively coupled argon plasma (ICP) analysis, laboratory control samples were spiked with five constituents of concern and iron per the 16 field samples. Percent recovery for all tests were within the control limits of 80 to 120 percent.

To measure precision, the RPD between the laboratory control samples and the duplicate control samples were calculated. The RPD for both ICP and GFAA tests were less than the 20 percent control limits.

6.2.1.2 Surrogate Recovery

Volatile Organics

Each environmental sample and laboratory control sample was spiked with a known quantity of the three surrogate analytes. The surrogate spike analytes and their representative quality control limits are listed in **Table 17**. The laboratory accuracy was determined by measuring the recovery of the surrogate spike. For the laboratory control samples, all percent recoveries were within their control limits. For the environmental samples, samples from three monitoring wells were outside of the QC limits. Environmental samples were reanalyzed if surrogate recoveries were out of control. If the percent recovery for the second analysis was outside of the control limits, matrix interference was established. The monitoring wells which had samples with out of control surrogate recoveries were MW-106D, MW-101, and MW-110. The data results for these three wells were qualified as estimated.

Semivolatile Organics

Each environmental sample and laboratory control sample was spiked with a known quantity of the six surrogate analytes. The surrogate spike analytes and their representative quality control limits are listed in **Table 17**. The laboratory accuracy was determined by measuring the recovery of the surrogate spike. For the laboratory control samples, all percent recoveries were within their control limits. For the environmental samples, samples from three monitoring wells were outside of the QC limits. All environmental samples which had recoveries out of control were reanalyzed. If the percent recovery for the second analyses was also out of control, the data results for that environmental sample were qualified as unusable. The low surrogate recoveries indicated the presence of matrix interference within the sample. The monitoring wells which had samples with out of control surrogate recoveries were MW-101, MW-108D, and MW-110.

PCBs and Pesticides

Each environmental sample and laboratory control sample was spiked with a known quantity of the surrogate analyte. The surrogate spike analyte and its representative quality control limits are listed in **Table 17**. The laboratory accuracy was determined by measuring the recovery of the surrogate spike. For the laboratory control samples, all percent recoveries were within their control limits. For the environmental samples, samples from two monitoring wells were outside of the QC limits. The data for these environmental samples (MW-107 and MW-112) were qualified as estimated. The low surrogate recoveries indicated the presence of matrix interference within the sample.

6.2.1.3 Matrix Spike and Matrix Spike Duplicates

Volatile Organics

For each laboratory batch, an environmental matrix spike and matrix spike duplicate were analyzed, which represents a 25 percent frequency. Three samples were analyzed and are listed in **Table 12**. Laboratory accuracy was measured by the percent recovery, and precision was measured by the RPD between the matrix spike and matrix spike duplicate samples. Each sample was spiked with a known quantity of the five matrix spike analytes. The matrix spike analytes and their representative quality control limits are listed in **Table 17**.

For each matrix spike and matrix spike duplicate sample, the percent recovery was measured five times, and the RPD was measured five times. 90 percent were within the QC limits for percent recovery, and 93 percent were within the QC limits for RPD.

Semivolatile Organics

For the semivolatile organic analysis, one matrix spike and matrix spike duplicate was analyzed using a laboratory control sample or method blank. Laboratory accuracy was measured by the percent recovery, and precision was measured by the RPD between the matrix spike and matrix spike duplicate samples. Each sample was spiked with a known quantity of the 11 matrix spike analytes. The matrix spike analytes and their representative quality control limits are listed in **Table 17**.

For each matrix spike and matrix spike duplicate sample, the percent recovery was measured 11 times, and the RPD was measured 11 times. All analytes were within the QC limits for percent recovery, and all analytes were within the QC limits for RPD.

PCBs and Pesticides

For the PCBs and pesticides analysis, two matrix spike and matrix spike duplicate samples were analyzed, using laboratory control samples. Laboratory accuracy was measured by the percent recovery, and precision was measured by the RPD between the matrix spike and matrix spike duplicate samples. Each sample was spiked with a known quantity of the six matrix spike analytes. The matrix spike analytes and their representative quality control limits are listed in **Table 17**.

For each matrix spike and matrix spike duplicate sample, the percent recovery was measured six times, and the RPD was measured six times. 92 percent of the spiked samples were within the QC limits for percent recovery, and all samples were within the QC limits for RPD.

Metals

For the metals analysis, one environmental matrix spike per SW-846 method was analyzed to determine laboratory accuracy, measured by percent recovery. Each sample was spiked with a known quantity of the constituents of concern (**Table 19**). For the GFAA and CVAA test methods, the groundwater sample from MW-106 was spiked with five constituents of concern. Percent recovery for all tests were within the quality control limits of 75 to 125 percent. For the ICP method, the groundwater sample from MS-109 was spiked with five constituents of concern and iron. Percent recovery for all tests were within the control limits of 75 to 125 percent.

6.2.1.4 Accuracy of Field Measurements

The accuracy of field measurements for pH, conductivity, and turbidity were assessed through pre-measurement calibrations and post-measurement verifications. The pH calibrations were conducted by using three standard buffer solutions. The calibration measurement was within $\pm$ 0.1 standard units for the buffer solution values; if not, the pH instrument was recalibrated. For conductivity calibration, two standard solutions were used. Standard solutions included deionized water (0 μmhos/cm) and 1000 μmhos/cm solution. For turbidity calibrations, two to three standard solutions were used. The standard solutions were deionized water (0 Ntu), 40 Ntu, and 400 Ntu solutions.

6.2.2 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, or an environmental condition. Field duplicate, equipment rinsate, trip blanks, and laboratory control samples were collected and analyzed to assess representativeness.

6.2.2.1 Field Duplicates

Field duplicate samples were taken for QA/QC to qualify representativeness. A QC field duplicate sample was taken for samples from MW-108D and MW-111-92, and a QA field duplicate sample was taken for samples from MW-107D and MW-109-92 (**Table 12**). QC samples were analyzed by Ortek, and QA samples were analyzed by USACE - MRD.

Analytical results of the QC samples appeared to be representative of the respective groundwater sample. For the constituents that were detected, which consisted of the metals group, the concentration data of each constituent had low variability (**Table 20**).

For the metals analysis, the laboratory conducted a duplicate analysis of an environmental sample per batch and calculated the RPD. Tests for the laboratory duplicates were less than the 20 percent RPD control limits. For the GFAA method tests, the groundwater sample for MS-106 was used for the analysis. For the ICP method tests, the sample from MW-109 was used for the analysis.

6.2.2.2 Laboratory Control Samples (Method Blanks)

Laboratory control samples or method blanks were taken by Ortek laboratory for each batch of samples and for each batch of reanalyzed samples. The laboratory control samples were carried through all steps of the analytical procedure and were used to measure any possible contamination. A total of 9 (17 percent frequency) laboratory control samples were analyzed for the organic analyses. More laboratory control samples were analyzed than required due to environmental samples being reanalyzed.

For the volatile organics analysis, several laboratory control samples detected acetone. Acetone was first detected in the environmental sample from MW-107D at a level outside of the instrument's calibration range. Laboratory control samples and several environmental samples detected acetone after the MW-107D sample was run. The acetone in these samples was due to probable instrument contamination from laboratory cleaning or sample MW-107D.

For metals analysis, one laboratory control sample per SW-846 method was analyzed. No constituents of concern were detected in the laboratory control samples.

6.2.2.3 Equipment Rinsate Samples

Rinsate samples were taken to identify any contamination from improper decontamination procedures. The rinsate samples were taken by rinsing the decontaminated bailer with deionized water and collecting the water in the sample containers. Two QC equipment rinsate samples and one QA equipment rinsate sample was taken. The QC rinsate samples were labeled as MW-112 and MW-114, and the QA rinsate sample was labeled as MW-113.

For the volatile organic analyses, the rinsate samples detected acetone. This acetone contamination was probably due to instrument contamination after analyzing the sample from MW-107, as discussed in the previous Section 6.2.2.2. No other volatile constituents were detected in the rinsate samples.

For the semivolatile organics and the PCBs and pesticides analyses, no constituents of concern were detected above the respective reporting limits.

For metals analyses, rinsate samples had concentrations that were at or below the reporting limits (**Table 20**).

6.2.2.4 Trip Blanks

Trip blanks which were prepared by Ortek laboratory were analyzed for volatile organic constituents of concern (**Table 19**). Trip blanks were taken to determine if interference or contaminants were introduced during the entire process of collecting, shipping, and storing samples. The QC trip blanks were labeled as MW-113-TB and MW-114-TB, and the QA trip blanks were labeled as MW-112-TB and MW-115-TB.

For the QC trip blanks, acetone was detected in both samples. The acetone contamination is probably due to instrument contamination as discussed previously in Section 6.2.2.2. No other volatile constituents were detected in the trip blank samples.

6.2.3 Completeness and Comparability

6.2.3.1 Completeness of Analyses

Completeness is defined as the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The completeness goal of 80 percent was to generate a sufficient amount of valid data to support the NL Site field investigation objectives. The valid data set contains all QC analyses verifying precision and accuracy for the analytical methods. In addition, all data was reviewed in terms of stated goals in order to assess the sufficiency of the data base.

Completeness for the groundwater sampling analysis was 97.8 percent (**Table 18**). Most unusable data was due to low surrogate spike recoveries which were an indication of matrix interference within the environmental sample.

6.2.3.2 Laboratory Sample Handling

The following information pertaining to laboratory sample handling was taken from Ortek's QAPP (**PDFI Appendix M**). When coolers containing the samples arrived at the laboratory, samples were checked in by the Sample Custodian using the Chain-of-Custody Form. All samples contained in the shipment were compared to the chain-of-custody record to assure that all samples designated on the chain-of-custody were received. Any discrepancies found in the documentation, accompanying the sample shipment, were documented on an Out-of-Control Form, and WCC was notified immediately.

Samples were placed in appropriate storage areas, and the chemists were notified. Access to samples was limited to authorized personnel, and a sample check out card system was maintained. An internal Sample Log-in Form was started for the samples at the time of check-in. Samples remained in cold storage until it became unnecessary to retain the samples which was determined after all data validation by WCC was complete. Upon disposal, the transfer of the samples was noted on the chain-of-custody record.

6.2.3.3 Sample Holding Time Nonconformances

The sample holding time requirements for each chemical group are included in **Table 21**. Sample holding times for each sample was tracked with the sample tracking system. All sample holding times were in conformance for the first groundwater analysis. For several volatile organic samples which had surrogate or matrix spike recoveries out of control, reanalysis was performed outside of holding times. Data was qualified as estimated, if necessary, in accordance with USEPA data validation procedures.

6.2.3.4 Reporting Limits and Sample Dilutions

Sensitivity of analytical testing is determined by the reporting limits shown in **Table 19**. These reporting limits were achieved for majority of the analytical groundwater samples. Samples with higher reporting limits were samples with high concentration levels that were not within the calibration range of the analytical equipment. Sample dilution was required prior to analysis which raised the reporting limit by a factor of the dilution amount.

6.2.3.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability was assured through the use of a single laboratory for the groundwater analysis that uses established and approved analytical methods, standard operating protocols, and a laboratory quality control program. The laboratory quality control program was designed to establish consistency of methodology and comparability to other laboratory results by including measurements of independent reference materials.

6.3 LABORATORY CORRECTIVE ACTION

Corrective action was applied when any measurement system failed to follow the laboratory QAPP or CDAP Data Quality Objectives. The laboratory QA Supervisor reviewed the data generated to verify that all quality control samples were within the established control limits. Data generated with laboratory control samples that did not fall within control limits were considered suspect, and the sample analysis was repeated or samples results were reported with qualifiers if reanalysis was not possible.

Corrective action was also applied after WCC conducted an independent data validation of the laboratory data package. When nonconformances were identified by the WCC data review specialist, the Project Manager and laboratory's Project Manager were notified and corrective action was applied.

6.3.1 Soil Analysis

Laboratory corrective actions conducted for the soil analyses by Environmental Science Engineering, Inc (ESE) included the following actions.

At WCC's request, all samples collected for TCLP - lead analysis were ground prior to sample preparation. WCC requested this change in procedure, because soil samples from the Remote Fill Areas contained large pieces of battery casing material. These pieces may have been filtered out in the sample preparation. Since the battery casing material is a primary lead source, the material should be included in the sample analysis. This procedural change in sample preparation began with samples collected after January 1, 1992. For each TCLP - lead sample this procedural change was labeled on the chain-of-custody under remarks as "pulverize sample".

For each laboratory data package, several sample identification numbers were reported incorrectly in the report. Using the Sample Tracking System, these labeling errors were identified. ESE laboratory was notified, labels on the sample containers were checked for correct identification, and the corrections were included in the final report.

Fifteen environmental matrix spike and matrix spike duplicate analyses failed to meet quality control limits, because of spiking procedural errors. At WCC's request, the spiking procedures for these samples were investigated. For seven samples the samples were spiked with a pipet which was incorrectly calibrated. The pipet was recalibrated and the MS/MSD target values were recalculated. The percent recovery and RPD for seven samples were within the QC limits. The laboratory sample identification numbers were: WWC6*529, WWC6*549, WWC6*569, WWC6*589, WWC6*609, WWC6*629, and WWC6*649. For five samples, the laboratory concluded that sample inhomogeneity was the reason the MS/MSD analyses were out of control. These lab sample ID numbers were: WWC4*949, WWC5*50, WWC5*150, WWC5*789, and WWC5*609. For the remaining three samples identified, there was MS/MSD procedural error. The lab sample ID numbers were: WWC5*70, WWC5*91, and WWC5*549. These three samples were qualified as estimated and are currently being reanalyzed.

For each laboratory data package, several items from the laboratory's quality control summary were missing. An example of these items may have included:

- Soil moisture content calculations (percentage of a data set)
- For a specific analysis date - method blank, continuing calibration verification, standard and sample matrix spike and replicate summary
- Chain-Of-Custodies

After identification of these items by the data reviewer, ESE was contacted and delivered the missing information which was incorporated into the data validation and the respective laboratory data package.

For the sample identified as SHA0202100CT, to be analyzed for TCLP-Lead, the extraction vessel blew up during the extraction process. ESE immediately notified WCC of the problem. Corrective action was taken by WCC instructing ESE to use the sample analyzed for Total Lead at this location and depth interval for the TCLP-Lead analysis. The Total Lead sample was identified as SHA0202100CL.

6.3.2 Groundwater Analysis

No laboratory corrective actions for the groundwater analysis were required.

6.4 DATA VALIDATION, REDUCTION, AND REPORTING

The analytical data generated by the analytical laboratories were checked for accuracy and completeness. The data validation process for this project consisted of data generation, reduction, and three levels of review.

The first level of review was conducted by the analytical laboratory (ESE, Ortek, WCC-Clifton) which had the initial responsibility for the correctness and completeness of the data. All data were generated and reduced following guidelines specified in the ESE QAPP (**CDAP Appendix B**) and Ortek QAPP (**PDFI Appendix M**). The laboratories evaluated the quality of the work based on an established set of guidelines. The review process checked that:

- Sample preparation information was correct and complete
- Analysis information was correct and complete
- The appropriate SOPs were followed
- Analytical results were correct and complete
- QC samples were within established control limits
- Blank correction procedures were followed
- Special sample preparation and analytical requirements were met
- Documentation was complete (anomalies in preparation and analysis were documented; Out of Control forms, if required, were completed; holding times were documented)

In-house analytical data reduction and QA review was performed under the review and direction of the ESE and Ortek Laboratory QA Directors. The Laboratory QA Directors and Project Managers were responsible for advising WCC's PM of any data which were rated as "preliminary", "unacceptable", or with other notations that would caution the user of possible unreliability. The sequence of data reduction, QA review, and reporting by the laboratories were as follows:

- Raw data produced by the analyst was given to an independent reviewer

- The independent reviewer assessed the data for attainment of quality control criteria as outlined in EPA SW-846, Third Edition and/or established EPA methods
- Upon acceptance of the raw data the final report was prepared and reviewed by the PM to ensure that the data met the overall objective of the client

Data Reduction and reporting procedures were those specified in SW-846, as was indicated in the laboratory QAPP's.

Full analytical and QC documentation were prepared and retained by the laboratories. This documentation was not retained in hard copy format, but rather on electronic digital media. As needed the laboratories will provide hard copies of the retained information.

The laboratories reported the data in the same chronological order that the samples were analyzed, along with supporting QC data. The following was included in the hard copy of each analytical data package:

- Cover sheet listing the samples included in the report and narrative comments describing problems encountered in analysis
- Tabulated results including matrix specific detection limits for inorganic and organic compounds identified and quantified
- Analytical results for QC sample spikes, sample duplicates, standard procedural blanks, and laboratory control samples
- Tabulation of instrument detection limits determined according to SW-846

For organic analyses, the data packages included matrix spikes, matrix spike duplicates, surrogate spike recoveries, and initial and continuing calibrations. The data reduction and validation steps were documented, signed, and dated by the analyst. The data packages were then forwarded to WCC for an independent review that included data validation.

For inorganics analyses, the data packages included matrix spikes, matrix spike duplicates, surrogate spike recoveries, and initial and continuing calibrations. The data reduction and validation steps were documented, signed, and dated by the analyst. The data packages were then forwarded to WCC for an independent review that included data validation.

The second level of review was performed by WCC to provide an independent validation of the laboratory data package. The validation process was conducted in accordance with "USEPA Guidelines for the Validation of Laboratory Data" (USEPA, 1988), and was structured to check that:

- QC samples were within established guidelines
- Documentation was complete and correct (anomalies in the preparation and analysis were documented; Out-of-Control forms, if required, were completed; holding times were documented; corrective action forms were completed, if required and action was taken to correct the deficiency)
- The data was ready for incorporation into the final report
- The data package was complete and ready for data archive

The data validation review was structured so that all QC and holding time data were reviewed. If no problems were found, the review was considered complete. If any problems were identified, the WCC PM resolved the problems with the laboratory.

The reviewer identified any questionable or out-of-control QC data and contacted the laboratory to correct the deficiencies. Decisions to repeat sample collection and analysis were made by the PM based on the extent of the deficiencies and their importance in the overall context of the project.

This data review process was documented in an office memorandum, signed by the reviewer. The reviewed data was then released to the PM with a narrative statement incorporated into the memorandum that the data was acceptable, acceptable with reservation, or not acceptable, and include the reasons for this determination.

The third level of review was conducted by the WCC Project QA/QC Officer or his/her representative who randomly audited representative project data packages. This QA audit reviewed:

- Holding times were met
- Documentation was complete
- QC results were complete and accurate

Qualifiers were assigned to data when a result from the above items were out of control. The following code letters were used to describe, or qualify laboratory data:

U - The compound was analyzed for but was not detected. The associated numerical value is attributed to contamination and is considered to be the sample quantitation limit.

J - The associated numerical value is an estimated quantity.

UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated quantity.

R - The data are unusable (whether the compound is present or not). Resampling and reanalysis are necessary for verification.

The WCC assessment of the data package was accomplished by the joint efforts of the WCC Project QA/QC Officer and PM. The data assessment by the PM was based on the assumption that the sample was properly collected and handled as specified in the CDAP.

6.5 LABORATORY SYSTEMS AUDITS

A systems audit of both ESE and Ortek laboratory operations was conducted by WCC personnel prior to the start of the field phase of the project to review the total data generation process. This audit included an on site review of basic laboratory capabilities, general laboratory facilities, sampling and analysis procedures, and the effectiveness of the laboratory's QA program. The audit of ESE was conducted in July, 1991, and the audit of Ortek was conducted in November, 1991.

The results of the audits indicated that each of the laboratories had the qualified personnel, facilities, and equipment necessary to meet project requirements for analyses of soil or water samples.

As suggested in the report for the ESE audit, a follow-up audit of ESE was conducted in June, 1992. The results of the follow up audit at ESE indicated that the laboratory performance on the NL/Taracorp project was meeting project goals and standards. One concern was raised in the area of TCLP analysis. The WCC auditor was concerned that matrix effects may compromise the data. A review of TCLP analysis data indicated that the results were acceptable and no further action was taken.

7.0
CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The Pre-Design Field Investigation (PDFI) for the NL Site in Madison County, Illinois, was conducted as part of Woodward-Clyde Consultants indefinite delivery contract with the United States Army Corps of Engineers, Omaha District (Contract No. DACW45-90-D-0008).

The QCSR summarizes the objectives, functional activities and specific Quality Control and Quality Assurance activities associated with the PDFI. The QCSR described procedures conducted to achieve the specific data goals of the PDFI and that precision, accuracy, sensitivity, completeness, and representativeness of the collected data were achieved and documented. The objective of the PDFI was to provide information for the design of the remedial action at the NL Site. A variety of tasks were completed to accomplish this objective. These included an extensive field sampling program on both the industrial and residential properties. The goal of the field sampling program was to delineate where surficial soils will require excavation to achieve the clean up levels established in the record of decision (500 ppm for residential areas and 1000 ppm for industrial areas).

The PDFI concentrated on three principle areas: the Main Industrial Property (Taracorp, Trust 454, BV&G Transport, and Rich Oil), the Adjacent Residential Area within Granite City and Madison, and the Remote Fill Areas.

The Main Industrial Property consists of approximately 30 acres of property which includes a former secondary lead smelting facility (NL/Taracorp) and a battery recycling operations (St. Louis Lead Recyclers (SLLR)). Two separate waste piles, the Taracorp pile and the SLLR pile, cover portions of the industrial property.

The Adjacent Residential Area includes approximately 500 acres within Granite City and Madison, Illinois. The lead contamination present in the soil is believed to be due to airborne particulate fallout from the secondary lead smelter.

Fill material derived from the Taracorp of SLLR piles has been documented in eight locations in the vicinity of the NL Site. The Remote Fill Areas include Eagle Park Acres, Venice Township, three areas north of Granite City, and three areas within Granite City.

To collect the required data for remedial analysis and design, an extensive soil sampling program was conducted for the Main Industrial Property, the Adjacent Residential Area, and the Remote Fill Areas. To supplement the field sampling program, an aerial survey, photogrametric mapping, and ground survey of the NL Site were conducted to generate topographic and planimetric maps of the NL Site area. Four deep monitoring wells were installed and developed on or near the Main Industrial Property. These wells were installed to supplement the existing network of fourteen shallow wells. The first semi-annual groundwater sampling event was conducted in July, 1992. Interior visual home inspections were offered and conducted for residents living in the Adjacent Residential Area to identify possible sources of lead exposure. Field activities conducted followed the standard operating procedures for the specific task as identified in the CDAP Appendixes (1991).

One task which deviated from the CDAP was the final number of soil samples collected in the Adjacent Residential Area was substantially less than that specified in the Scope of Work and CDAP. Several reasons for this deviation were:

- Only partial property access was obtained by the USEPA - Region V in the residential areas. Access was only available for 898 out of 1,595 properties.

- 54 properties were totally paved and/or cultivated and were not sampled as specified in the sampling procedures (SOP No. 1). This reduced the number of properties sampled to 844.

- An additional 62 properties were paved and/or cultivated in either the front or back yard such that only one of two HABs could be completed.

For the Remote Fill Areas, additional sampling was taken at three properties, 128 Roosevelt, 3108 Colgate, and 1628 Delmar. These three properties, identified by WCC personnel or residents, had battery casing material fill located on each property. After consultation with

USACE and USEPA, these properties were added to the Remote Fill Areas soil sampling program.

For the groundwater sampling event, only 12 of the 18 monitoring wells were sampled. Six wells were not sampled; four wells were dry and two wells had bent risers at the ground surface.

A laboratory methodology deviation from the CDAP and Scope of Work consisted of analyzing total lead level either by SW-846 Method 6010 (as specified in SOW) or SW-846 Method 7420. Upon approval from USACE, the soil samples collected in 1992 were analyzed by a FAA, Method 7420; whereas, the soil samples collected in 1991 were analyzed by a ICP, Method 6010.

Corrective actions taken during the soil sampling investigation consisted mainly of mislabeling sample identification numbers on the labels, chain-of-custody forms, or analytical reports. Using the sample tracking system, these problems were identified and corrected on the appropriate forms, logbooks, and sample labels.

For laboratory corrective actions, the soil samples for TCLP - lead analysis were pulverized prior to laboratory sample preparation. This was requested by WCC, because the large pieces of battery casing material, the lead source, may have been filtered out during sample preparation. This procedural change in sample preparation began with samples collected after January 1, 1992. For the environmental matrix spike and matrix spike duplicate analyses, 15 samples failed to meet quality control limits, because of spiking procedural errors. After laboratory corrective actions, only three of the fifteen samples were out of control due to spiking procedural errors. These three samples are currently being reanalyzed to correct the procedural errors.

A corrective action taken during the monitoring well installation and development consisted of changing the development pump from a centrifuge pump to a submersible pump as specified in the CDAP SOP No. 2. Another corrective action taken was the bentonite pellet seal was changed to a bentonite slurry seal, because of bridging problems caused during installation. The upper centralizer was also eliminated on the remaining wells. During development of each well, problems were encountered due to fines within the well-graded sand formation. For the final development of each well, the last five well volumes were bailed, and the development water would become turbid. In consultation with USACE personnel it was decided that complete development could not be accomplished in a reasonable time frame, and development was discontinued. However, development was sufficient to yield representative samples and valid analytical data.

For quality control and quality assurance of field activities, internal field checks of documentation and task(s) performance were conducted. For laboratory quality control and assurance, laboratory audits on ESE and Ortek were performed by WCC personnel prior to the start of the project to review the total data generation process. A follow-up audit of ESE was conducted during the soil sampling analysis. For analytical data validation, reduction, and reporting, the first level of review was conducted by the analytical laboratory which evaluated the quality of the work based on a established set of guidelines as specified by SW-846. The second level of review was performed by WCC personnel to provide an independent validation of the laboratory data package.

The analytical method specific Data Quality Objectives (DQO's) for the PDFI soil investigation of the NL Site included precision, accuracy, completeness, and sensitivity criteria. The QA objective was to achieve the QC acceptance criteria required by the analytical protocols in SW-846.

For Total Lead and TCLP-Lead analyses, laboratory accuracy was determined by assessing the recovery of lead from spiked laboratory control matrix samples. Recovery values were compared to control limits established under SW-846 guidelines. For Total Lead and TCLP-Lead analyses, the control limits are 75 to 125 percent. 324 laboratory control sample analyses were performed, a 6 percent frequency of total samples collected. 95 percent of the control sample analyses were within the percent recovery control limits.

Environmental matrix spike (MS) and matrix spike duplicate (MSD) analyses were used to assess the effects of the sample matrix on the precision and accuracy of the analyses. MS and MSD analyses were performed on a total of 285 and 279 soil samples, respectively. The recovery for 73 percent of the matrix spike samples were within the established control limits. The RPD for 24 percent of the MS/MSD pairs exceeded the control limit of 20 percent. Of the samples that were out of control, majority of the samples were attributed to sample inhomogeneity or matrix interference.

The completeness goal was set at 80 percent to generate a sufficient amount of valid data to support the soil investigation. Completeness for the Total Lead and TCLP-Lead analysis was 100 percent (**Table 18**).

The representativeness of the data generated from soil sample analyses was evaluated through the collection and analysis of field duplicates. A total of 281 field duplicates (5 percent of the total number of samples) were analyzed. In general, the data generated by the analysis of field duplicates was consistent with that of the corresponding samples.

The sensitivities for analytical testing are the reporting limits shown in **Table 19**. These reporting limits were achieved for a vast majority of the soil samples that were analyzed.

The analytical method specific Data Quality Objectives (DQO's) for groundwater samples collected from the NL Site included precision, accuracy, completeness, and sensitivity criteria. The QA objective was to achieve the QC acceptance criteria required by the analytical protocols in SW-846.

For groundwater metal analyses, laboratory accuracy was determined by assessing the recoveries of compounds of interest from spiked laboratory control matrix samples. The percent recoveries for all laboratory control samples were within the established control limits listed in **Table 16**. Laboratory precision is evaluated by measuring the RPD between each analyte in laboratory control sample pairs. The RPDs for control samples associated with project groundwater samples were below the established control limits listed in **Table 16**.

For the groundwater metals analyses, one environmental matrix spike per SW-846 method was analyzed to determine laboratory accuracy. Each sample was spiked with a known quantity of the constituents of concern. Percent recovery for the tests and the SW-846 methods were within the quality control limits of 75 to 125 percent.

For organic analyses including volatiles, semivolatiles, PCBs and pesticides; matrix spike, matrix spike duplicates, and surrogate spike analyses were conducted to assess the precision and accuracy of the analyses. Surrogate spike analyses were conducted for each sample and percent recovery was calculated. If surrogate recoveries were out of control, the sample was reanalyzed. For volatile organics analyses, surrogate recoveries indicated the presence of matrix interference for samples from three monitoring wells. The volatile organics data for these three wells were qualified as estimated. For semivolatile organic analyses, surrogate recoveries indicated the presence of matrix interference for samples from two monitoring wells. Due to the low surrogate recoveries, the semivolatile organics data for these two wells, MW-101 and MW-108-D, were qualified as unusable. Matrix spike and matrix spike duplicate analyses were within the control limits for precision and accuracy for all analyses except for the samples that had matrix interference indicated by the surrogate spike analyses.

The sensitivities for the groundwater analytical testing are the reporting limits shown in **Table 19**. These reporting limits were achieved for a vast majority of the groundwater samples that were analyzed.

The representativeness of data generated for the groundwater investigation was evaluated through the collection and analysis of field duplicates, equipment rinsate blanks, trip blanks and laboratory control samples. Four field duplicates, two equipment rinsate blanks, and two trip blanks were analyzed (**Table 12**). In general the data generated by the analysis of field duplicates was consistent with that of the corresponding samples. No significant contamination was detected in the rinsate or trip blanks.

Completeness for the groundwater sampling analysis was 97.8 percent (Table 18) which is above the 80 percent goal.

7.2 RECOMMENDATIONS

The efficiency and QA/QC level of the field investigation at the NL Site could have been improved significantly if the field activities had been conducted continuously until the field phase was completed. The soil sampling program for the Adjacent Residential Area was split into three field mobilizations, due to lack of property access. If the sampling had been completed during the first mobilization, laboratory methodology for soil analysis would have been consistent, and laboratory and field activities conducted by personnel would have been more consistent. If access for all properties would have been obtained prior to the start of field work, the task of collecting the soil samples would have taken less time. This task could have been expedited, because the sampling team(s) could have sampled each house on a block before moving to the next block. With the delays due to property access, the team(s) collected samples on each block two to four different times.

For future sampling events which may require a large number of samples, it is recommended to keep the Sample Tracking System and the Property Access Database active. Both systems were a critical path in documenting the quality control and quality assurance of the soil and groundwater sampling programs. During the Remedial Action Phase, the Property Access Database which keeps track of property owners and access information should be updated as new residential and access information is obtained for the area.

TABLE 1
ANALYTICAL PROCEDURES FOR NL SITE FIELD INVESTIGATION
NL/TARACORP SUPERFUND SITE

	TECHNIQUE (1)		EXTRACTION AND ANALYSIS METHOD (2)	
PARAMETER	WATER	SOIL	WATER	SOIL
Metals	ICP	-	3005/6010	-
Lead	GFAA	ICP or FAA	3020/7421	3051/6010 or 7420
Arsenic	GFAA	-	3020/7060	-
Selenium	GFAA	-	3020/7740	-
Mercury	CVAA	-	7470	-
TCLP-Lead	-	Extraction/ICP	NA	1311/3010/6010 or 7420
Volatiles	GC/MS	-	8240	-
Semi-Volatiles	GC/MS	-	(3510)/8270(3)	-
PCB/Pesticides	GC/ECD	-	(3510)/8080	-

(1) ICP - Inductively Coupled Argon Plasma
CVAA - Cold Vapor Atomic Absorption Spectrophotometer
GFAA - Graphite Furnace Atomic Absorption Spectrophotometer
GC/MS - Gas Chromatographic/Mass Spectrophotometer
FAA - Flame Atomic Absorption Spectrophotometer
(2) Method numbers from Third Edition, USEPA SW-846
(3) 3510 - Separatory Funnel Liquid - Liquid Extraction

TABLE 2
SAMPLE DISTRIBUTION AND FREQUENCY SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	NO. OF LOTS	PARAMETER	FIELD SAMPLES	QUALITY CONTROL: FIELD DUPLICATES	QUALITY CONTROL: MS/MSD SAMPLES	QUALITY CONTROL: LAB MS	QUALITY CONTROL: RINSATE BLANKS	QUALITY CONTROL: TRIP BLANKS	QUALITY CONTROL: TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE: FIELD DUPLICATES	QUALITY ASSURANCE: RINSATE BLANKS	QUALITY ASSURANCE: TRIP BLANKS	TOTAL QA SAMPLES
ADJACENT RESIDENTIAL AREA														
PROJECT TOTAL	898	TOTAL LEAD	5011	255	256/256		NA	NA	767	5778	507	NA	NA	507
		TCLP LEAD	10	0	3/2		NA	NA	5	15	0	NA	NA	0
MAIN INDUSTRIAL PROPERTY														
PROJECT TOTAL	4	TOTAL LEAD	105	14	6/6		NA	NA	25	130	9	NA	NA	9
		TCLP LEAD	0	0	0/0		NA	NA	0	0	0	NA	NA	0
REMOTE FILL AREAS														
EAGLE PARK ACRES TOTAL	9	TOTAL LEAD	72	6	2/2		NA	NA	10	82	7	NA	NA	7
		TCLP LEAD	25	2	8/4		NA	NA	14	39	2	NA	NA	2
OTHER REMOTE FILL AREAS TOTAL	6	TOTAL LEAD	12	1	0/0		NA	NA	1	13	1	NA	NA	1
		TCLP LEAD	17	1	7/6		NA	NA	14	31	2	NA	NA	2
VENICE ALLEYS TOTAL	7	TOTAL LEAD	0	0	0/0		NA	NA	0	0	0	NA	NA	0
		TCLP LEAD	10	1	0/0		NA	NA	1	11	1	NA	NA	1
MONITORING WELLS														
PROJECT TOTAL (SOIL SAMPLES)	4 WELLS*	TOTAL LEAD	23	1	3/3		NA	NA	7	30	0	NA	NA	25
		BTEX	1	0	0/0		NA	NA	0	1	0	NA	NA	1
PROJECT TOTAL	924	TOTAL LEAD	5223	277	267/267	314	NA	NA	810	6033	524	NA	NA	549
		FREQUENCY (%)		5.3	5.1	6.0	NA	NA	15.5		10.0	NA	NA	10.5
		TCLP LEAD	62	4	18/12	10	NA	NA	34	96	5	NA	NA	5
		FREQUENCY (%)		6.5	25.8	16.1	NA	NA	54.8		8.1	NA	NA	8.1
GROUNDWATER SAMPLING														
PROJECT TOTAL		SAMPLES	12	4**	2***	****	2	2	10	22	2	1	2	5
		FREQUENCY (%)		33.3	16.7		16.7	16.7	83.3		16.7	8.3	16.7	41.7

NOTES
- * Includes all Monitoring Wells' soil samples.
- ** 2 Field Duplicates did not include metals analysis.
- *** Matrix Spike/Matrix Spike Duplicate Analysis averaged 2 samples per test method. See QCSR Report for details.
- **** Number of Matrix Spike Control samples varied depending on test method. See QCSR Report for details.

BTEX = analysis for Benzene, Toluene, Ethyl-Benzene, and Xylene.

TABLE 3
SOIL SAMPLING DEPTH INTERVALS
NL/TARACORP SUPERFUND SITE

SITE	TYPE OF ANALYSIS	LOCATIONS	SAMPLE DEPTH (ft)
Adjacent Residential Area	Total Lead	893	0-0.25, 0.25-0.5, 0.5-1.0
	TCLP Lead	10	To be selected
Remote Fill Areas			
Eagle Park Acres	Total Lead	32	Variable
	TCLP Lead	23	Variable
Venice	TCLP Lead	12	Variable
Missouri Avenue (Ill Rte. 3 & I-270)	TCLP Lead	4	Variable
Schaeffer Road (Ill Rte. 3 & I-270)	TCLP Lead	3	Variable
2230 Cleveland	TCLP Lead	3	Variable
Sand Road (Farmer's Field)	Total Lead	7	Variable
	TCLP Lead	3	Variable
Main Industrial Property			
Trust 454	Total Lead	10	0-1, 1-2, 2-4, 4-6, 6-8, 8-10, 13-15
	Geotechnical	10	From 2 - 15 ft at 2 ft intervals
BV&G Transport	Total Lead	3	0-1, 1-2, 2-4, 4-6, 6-8, 8-10, 13-15
	Geotechnical	2	From 2 - 15 ft at 2 ft intervals
Rich Oil	Total Lead	2	0-1, 1-2, 2-4, 4-6, 6-8, 8-10, 13-15
	Geotechnical	6	From 2 - 15 ft at 2 ft intervals
Taracorp Site	Geotechnical	3	From 2-15 ft at 2 ft intervals
Monitoring Wells*	Total Lead	2	Variable

* Monitoring Wells section includes the wells used for statistical evaluation of the main industrial property.

TABLE 4

HOME INSPECTION SURVEY SUMMARY
NL/TARACORP SUPERFUND SITE

Task		Number of Residents
Interior Home Inspections Completed		212
Attempted Home Inspections - No Shows		17
Summary and Recommendation Letters Sent		
-Residents		191
-Non-Resident Owners		76
Contact Letter Sent Where Property Access Has Been Acquired		
-Residents		407
-Non-Resident Owners		151
Residents Contacted		
-Changed From Yes to No Access	Granite City	90
	Madison	41
Unable to Contact		
-4 Attempted Telephone Contacts		45
-Resident Visits		15

TABLE 5

DURATION OF FIELD ACTIVITIES
NL/TARACORP SUPERFUND SITE

Field Task	Dates Task Conducted
Adjacent Residential Area	November 4 - December 9, 1991
(HAB Soil Sampling)	March 2 - May 27, 1992
	August 12 - August 13, 1992
Remote Field Areas	
(HAB Soil Sampling)	
Missouri Ave.	December 10, 1991 & June 29, 1992
Schaeffer Road	December 10, 1991
2230 Cleveland	April 22, 1992
3108 Colgate	May 13, 1992
1628 Delmar	May 13, 1992
Sand Road	May 20, 1992
Eagle Park Acres	May 19 - May 28, 1992
Remote Fill Areas	
(Drilling Rig Borings)	December 2 - December 4, 1991
Venice Alleys	June 29, 1992
Missouri Ave.	
Main Industrial Property	
(Drilling Rig Borings)	November 15 - November 25, 1991
Monitoring Well	November 26 - November 27, 1991
Installation and Development	December 5 - December 9, 1991
	June 8 - June 29, 1992
Monitoring Well Slug Test	July 22, 1992
Groundwater Sampling	June 15, 1992
	July 13 - July 15, 1992
Ground Survey	December 18, 24, 26, 31, 1991
	Feburary 20, 1992
	May 27 - 28, 1992
	July 14, 16, 30, 1992
Home Inspection Survey	November 19 - November 21, 1991
	December 2 - December 5, 1991
	April 28 - May 2, 1992
	May 5 - May 6, 1992

TABLE 6

PROBLEMS ENCOUNTERED DUE TO WEATHER CONDITIONS
NL/TARACORP SUPERFUND SITE

DATE	WEATHER CONDITIONS	PROBLEMS ENCOUNTERED
11-07-91	4 in. snow	Cold temperatures slowed HBA team; Quit 1 hr. early
11-08-91	8° - 15°F	No sampling conducted
11-19-91	Heavy rain and lightening	HAB and drilling rig teams ceased operations at 3:30 pm
11-20-91	Overcast 32° - 50°F Rain/drizzle	Drill rig hammer rope became soaked. Replaced rope.
11-25-91	20°F	Cold temperature delayed HAB teams three hours
11-26-91	20°F	Delayed HAB team 1 hour
12-02-91	Rain to freezing rain 30° - 33°F	HAB teams worked only in the morning
12-03-91	Temp. Dropped in afternoon to <25°F	HAB teams quit at 3:30 pm
12-04-91	10° - 15°F Wind chill -15°F	No HAB sampling conducted
3-10-92	Drizzling rain and windy 20° - 30°F	No HAB sampling conducted
3-12-92	Overcast 25° - 30°F	Delayed start of HAB sampling
3-13-92	20° - 25°F	Delayed to noon start of HAB sampling
3-18-92	Rain 32° - 50°F	No HAB sampling conducted

TABLE 6

PROBLEMS ENCOUNTERED DUE TO WEATHER CONDITIONS NL/TARACORP SUPERFUND SITE

DATE	WEATHER CONDITIONS	PROBLEMS ENCOUNTERED
3-19-92	3 in. snow	Delayed to 9:00 am HAB sampling Soil conditions sticky Sampling procedure took longer
3-25-92	Raining off and on	Soil conditions sticky. Sampling procedure took longer. Problem with documentation paper getting wet.
4-08-92	40° - 75°F	Dark blue Tyvek™ very hot Request for change in SSHP to wear white Tyvek™ and documentation person not to wear Tyvek™
4-14-92	50° - 85°F	Conducted HAB sampling before the afternoon heat
5-12-92	Rain	Delayed HAB sampling 1 hour
5-20-92	65° - 85°F	Due to hot weather, took more water breaks than normal
6-17-92	80° - 90°F	Drilling rig team stopped for frequent breaks

TABLE 6

PROBLEMS ENCOUNTERED DUE TO WEATHER CONDITIONS
NL/TARACORP SUPERFUND SITE

TABLE 7

MAIN INDUSTRIAL PROPERTY ANALYTICAL SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

				QUALITY CONTROL				QUALITY ASSURANCE	
METHOD	BORINGS	PARAMETER	FIELD SAMPLES	FIELD DUPLICATES	MS/MSD SAMPLES	TOTAL QC SAMPLES	TOTAL WCC SAMPLES	FIELD DUPLICATES	TOTAL QA SAMPLES
B.V. & G.	1	TOTAL LEAD	7	3	0/0	3	10	0	0
		TCLP LEAD	0	0	0/0	0	0	0	0
	2	TOTAL LEAD	7	0	1/1	0	7	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	3	TOTAL LEAD	7	0	0/0	0	7	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
TRUST 454	1	TOTAL LEAD	7	1	1/1	1	8	0	0
		TCLP LEAD	0	0	0/0	0	0	0	0
	2	TOTAL LEAD	7	1	0/0	1	8	0	0
		TCLP LEAD	0	0	0/0	0	0	0	0
	3	TOTAL LEAD	7	2	0/0	2	9	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	4	TOTAL LEAD	7	1	0/0	1	8	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	5	TOTAL LEAD	7	0	0/0	0	7	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	6	TOTAL LEAD	7	2	0/0	2	9	0	0
		TCLP LEAD	0	0	0/0	0	0	0	0
	7	TOTAL LEAD	7	1	0/0	1	8	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	8	TOTAL LEAD	7	0	1/1	0	7	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	9	TOTAL LEAD	7	0	0/0	0	7	0	0
		TCLP LEAD	0	0	0/0	0	0	0	0
	10	TOTAL LEAD	7	0	0/0	0	7		
		TCLP LEAD	0	0	0/0	0	0	0	0
RICH OIL	1	TOTAL LEAD	7	1	1/1	1	8	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
	2	TOTAL LEAD	7	2	1/1	2	9	1	1
		TCLP LEAD	0	0	0/0	0	0	0	0
PROJECT TOTAL WITHOUT WELLS	15	TOTAL LEAD	105	14	6/6	26	129	9	9
		TCLP LEAD	0	0	0/0	0	0	0	0
MONITORING WELLS*									
MW108-92	1	TOTAL LEAD	5	0	0/0	0	5	0	0
		BTEX	1	0	0/0	0	1	0	0
MW109-92	1	TOTAL LEAD	6	0	0/0	0	6	0	0
PROJECT TOTAL WITH WELLS*	17	TOTAL LEAD	116	14	6/6	26	140	9	9
		TCLP LEAD	0	0	0/0	0	0	0	0

* Includes only the wells used for the statistical evaluation for the Main Industrial Property.

TABLE 8
MAIN INDUSTRIAL PROPERTY GEOTECHNICAL SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

METHOD	BORINGS	PARAMETER	FIELD SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	TOTAL SAMPLES
B.V. & G.	1	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	3	1	4
		MOISTURE CONTENT	6	1	7
	2	ATTERBURG LIMITS	0	0	0
		GRAIN SIZE	1	0	1
		MOISTURE CONTENT	6	0	6
	3	ATTERBURG LIMITS	0	0	0
		GRAIN SIZE	0	0	0
		MOISTURE CONTENT	0	0	0
RICH OIL	1	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	2	0	2
		MOISTURE CONTENT	6	0	6
	2	ATTERBURG LIMITS	0	0	0
		GRAIN SIZE	0	0	0
		MOISTURE CONTENT	0	0	0
TARACORP	1	ATTERBURG LIMITS	0	0	0
		GRAIN SIZE	5	0	5
		MOISTURE CONTENT	6	0	6
	2	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	3	0	3
		MOISTURE CONTENT	6	0	6
	3	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	3	0	3
		MOISTURE CONTENT	6	0	6
TRUST 454	1	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	2	1	3
		MOISTURE CONTENT	6	1	7
	2	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	3	0	3
		MOISTURE CONTENT	6	0	6
	3	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	2	1	3
		MOISTURE CONTENT	6	1	7
	4	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	3	0	3
		MOISTURE CONTENT	6	0	6
	5	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	2	1	3
		MOISTURE CONTENT	6	1	7
	6	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	2	0	2
		MOISTURE CONTENT	6	0	6
	7	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	2	1	3
		MOISTURE CONTENT	6	1	7
	8	ATTERBURG LIMITS	1	1	2
		GRAIN SIZE	2	1	3
		MOISTURE CONTENT	6	1	7
	9	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	3	0	3
		MOISTURE CONTENT	6	0	6
	10	ATTERBURG LIMITS	1	0	1
		GRAIN SIZE	2	0	2
		MOISTURE CONTENT	6	0	6
MONITORING WELL SAMPLES					
TRUST 454 PROPERTY		GRAIN SIZE	3	0	3
1628 DELMAR		GRAIN SIZE	1	0	1
PROJECT TOTAL		ATTERBURG LIMITS	14	6	20
		GRAIN SIZE	44	6	50
		MOISTURE CONTENT	96	6	102

TABLE 9
ADJACENT RESIDENTIAL AREA SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	NO. OF LOTS	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
ADJACENT RESIDENTIAL AREA	898	TOTAL LEAD	5011	255	256/256	767	5778	507	507
		TCLP LEAD	10	0	3/2	5	15	0	0
PROJECT TOTAL	898	TOTAL LEAD	5011	255	256/256	767	5778	507	507
		TCLP LEAD	10	0	3/2	5	15	0	0

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
EAGLE PARK ACRES							0	0	0
108 CARVER	1	TOTAL LEAD	1	0		0	1	0	0
		TCLP LEAD	1	0		0	1	0	0
	2	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
111 CARVER	1	TOTAL LEAD	1	0		0	1	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	1	0		0	1	0	0
		TCLP LEAD	0	0		0	0	0	0
202 A HARRISON	1	TOTAL LEAD	4	0		0	4	0	0
		TCLP LEAD	2	0		0	2	0	0
	2	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	2	0		0	2	0	0
	3	TOTAL LEAD	4	1		1	5	2	2
		TCLP LEAD	1	1		1	2	1	1
	4	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
203 HARRISON	1	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	3	TOTAL LEAD	3	1		1	4	0	0
		TCLP LEAD	2	0		0	2	0	0
	4	TOTAL LEAD	4	0		0	4	0	0
		TCLP LEAD	1	0		0	1	0	0
205 HARRISON	1	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	3	1		1	4	0	0
		TCLP LEAD	0	0		0	0	0	0
	3	TOTAL LEAD	3	0		0	3	1	1
		TCLP LEAD	2	1		1	3	0	0

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	MS/MSD SAMPLES	TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	TOTAL QA SAMPLES
Eagle Park Acres (Cont.)									
100 HILL	1	TOTAL LEAD	3	0		0	3	0	0
		TCLP LEAD	1	0		0	1	0	0
	2	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	1	0		0	1	0	0
128 ROOSEVELT	1	TOTAL LEAD	3	0		0	3	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	3	0		0	3	1	1
		TCLP LEAD	1	0		0	1	0	0
	3	TOTAL LEAD	3	0		0	3	0	0
		TCLP LEAD	2	0		0	2	0	0
203/205 TERRY	1	TOTAL LEAD	3	2		2	5	0	0
		TCLP LEAD	2	0		0	2	0	0
	2	TOTAL LEAD	3	0		0	3	1	1
		TCLP LEAD	1	0		0	1	1	1
	3	TOTAL LEAD	3	1		1	4	0	0
		TCLP LEAD	1	0		0	1	0	0
	4	TOTAL LEAD	3	0		0	3	0	0
		TCLP LEAD	1	0		0	1	0	0
208 TERRY	1	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	1	0		0	1	0	0
	2	TOTAL LEAD	2	0		0	2	1	1
		TCLP LEAD	1	0		0	1	0	0
	3	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	4	TOTAL LEAD	2	0		0	2	1	1
		TCLP LEAD	1	0		0	1	0	0
	5	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	1	0		0	1	0	0
EAGLE PARK ACRES TOTAL		TOTAL LEAD	72	6	2/2	10	82	7	7
		TCLP LEAD	25	2	8/4	14	39	2	2

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
OTHER REMOTE FILL AREAS									
2230 CLEVELAND	3	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	1		1	2	0	0
	4	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	1	1
	5	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
3108 COLGATE	1	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	1	0		0	1	0	0
	2	TOTAL LEAD	3	0		0	3	0	0
		TCLP LEAD	0	0		0	0	0	0
1628 DELMAR	3	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	4	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	5	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
MISSOURI AVE									
	7	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	8	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	9	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	10	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	13	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	14	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	15	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	2	0		0	2	0	0

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
Other Remote Fill Areas (Cont.)									
SAND ROAD									
(Farmer's Field)	1	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	2	0		0	2	0	0
		TCLP LEAD	0	0		0	0	0	0
	3	TOTAL LEAD	3	1		1	4	1	1
		TCLP LEAD	0	0		0	0	1	1
SCHAEFFER ROAD									
	4	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	5	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	6	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
OTHER REMOTE FILL AREAS TOTAL		TOTAL LEAD	12	1	0/0	1	13	1	1
		TCLP LEAD	17	1	7/6	14	31	2	2
<u>VENICE ALLEYS</u>									
BROADWAY & LINCOLN									
6TH–7TH	1	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	2	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
HAMPTON & ABBOTT									
2ND–3RD	3	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	4	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
Venice Alleys (Cont.)									
HAMPTON & ABBOTT WEST OF 2ND	5	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	6	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	7	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
GRANVILLE & WEBER 2ND-3RD	8	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	9	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	1		1	2	0	0
GRANVILLE & WEBER WEST OF 2ND	10	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	11	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
ORIOLE & KLEIN NORTH OF BROWN ST	12	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	13	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
	14	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	15	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	1	1
SLOUGH ROAD	16	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	17	TOTAL LEAD	0	0		0	0	0	0

TABLE 10

REMOTE FILL AREAS SOIL SAMPLING SUMMARY
NL/TARACORP SUPERFUND SITE

LOCATION	BORING NUMBER	PARAMETER	FIELD SAMPLES	QUALITY CONTROL FIELD DUPLICATES	QUALITY CONTROL MS/MSD SAMPLES	QUALITY CONTROL TOTAL QC SAMPLES	TOTAL WCC SAMPLES	QUALITY ASSURANCE FIELD DUPLICATES	QUALITY ASSURANCE TOTAL QA SAMPLES
Venice Alleys (Cont.)		TCLP LEAD	1	0		0	1	0	0
	18	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	19	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	0	0		0	0	0	0
	20	TOTAL LEAD	0	0		0	0	0	0
		TCLP LEAD	1	0		0	1	0	0
VENICE ALLEYS TOTAL		TOTAL LEAD	0	0	0/0	0	0	0	0
		TCLP LEAD	10	1	0/0	1	11	1	1
PROJECT TOTAL		TOTAL LEAD	84	7	2/2	11	95	8	8
		TCLP LEAD	52	4	8/8	29	81	5	5

LEGEND

* = Data Pending ESE Laboratory Data Submittal

TABLE 11

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT RESIDENTIAL AREA SAMPLING NL/TARACORP SUPERFUND SITE

PROPERTY IDENTIFICATION NUMBER	PROBLEM ENCOUNTERED
Properties Not Sampled	
Bryan 2100	Paved Lot
Cleveland 2021	Front and backyard tilled or planted
Cleveland 2100	Paved Lot
Delmar 2012	Parking Lot
Delmar 2060	All property disturbed with in past 15 years
Delmar 2101	Paved Lot
Edison 1837	Paved Lot
Edison 2001	Covered by building
Edison 2165	Paved Lot
Eighteenth 1302	Front tilled, backyard accessed through house
Grand 0925	Paved Lot
Grand 1118	Paved Lot
Grand 1120	Paved Lot
Grand 1330/1332	Paved Storage Lot
Grand 2014	Front tilled, backyard accessed through house
Iowa 1314	Property in probate
Iowa 1335	Gravel Parking Lot
Madison 0909	Gravel and pavement
Madison 1303	Gravel Lot
Madison 1316	Gravel Lot
Madison 1348	No front yard, backyard paved

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT RESIDENTIAL AREA SAMPLING NL/TARACORP SUPERFUND SITE

PROPERTY IDENTIFICATION NUMBER	PROBLEM ENCOUNTERED
Properties Not Sampled (cont'd)	
Madison 1400	Lot entirely covered by building
Madison 1401	Lot entirely covered by building
Madison 2028	Building and pavement
Madison 2148	Paved Lot
Madison 2159	Commercial Property
Madison 2163	Commercial Property
Madison 2216	Paved Lot
Madison 2217	Tilled Lot
Niedringhaus 0944	Gravel Lot
Niedringhaus 1326	Paved Lot
Nineteenth 1315	Paved Lot
Nineteenth 1336	Under Construction; All gravel
State 0922	Gravel Lot
State 1000	Gravel Lot
State 1004	Gravel Lot
State 1114	Paved Lot
State 1122	Commercial Property
State 1436	Gravel Lot
State 1826	Paved Lot
State 1836	Paved Lot

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT
RESIDENTIAL AREA SAMPLING
NL/TARACORP SUPERFUND SITE

State 1840	Gravel and Building
PROPERTY IDENTIFICATION NUMBER	**PROBLEM ENCOUNTERED**
Properties Not Sampled (cont'd)	
State 1928	Gravel and Building
State 2201	Apartments and Paved Lot
Twenty-Second 1423	No front or backyard
Twenty-Third 1212	No yard to sample
Washington 1314/1316	Storage garages and paved lot
Washington 1409	Paved Lot
Washington 2021	Fill and gravel
Washington 2031	Gravel Lot
Washington 2043/2045	Paved Parking Lot
Washington 2047	Parking Lot
Washington 2102	Paved Lot
Washington 2166	Parking Lot

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT RESIDENTIAL AREA SAMPLING NL/TARACORP SUPERFUND SITE

PROPERTY IDENTIFICATION NUMBER	PROBLEM ENCOUNTERED
Properties Where Only One Boring Completed	
Adams 2108/2110	Dense trees and gravel in backyard
Adams 2114	Dense trees and gravel in backyard
Benton 2038	Backyard tilled and cement
Benton 2124/2126	Backyard gravel
Benton 2248	No backyard
Benton 2252	No backyard
Bryan 2025	Front yard filled
Bryan 2027	Front shaded and void of grass, tilled
Chestnut 1712	Backyard gravel
Cleveland 2254	Backyard gravel and cement, pool
Delmar 1745/1747	No backyard
Delmar 2124	No backyard
Delmar 2137/2139	Paved backyard
Delmar 2261	Access to backyard through house
Edison 1707	Front yard all concrete
Edison 1723	No way to leash large dogs in back
Edison 2117	Backyard gravel
Edison 2118	No front yard

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT RESIDENTIAL AREA SAMPLING NL/TARACORP SUPERFUND SITE

Edison 2122	Front yard shrubs and gravel
Edison 2229	Owner granted access for front yard only

PROPERTY IDENTIFICATION NUMBER	**PROBLEM ENCOUNTERED**
Properties Where Only One Boring Completed (cont'd)	
Elizabeth 1723	No backyard
Elizabeth 1918	No front yard
Elizabeth 1920	No front yard
Grand 0922	Backyard paved
Grand 1440	No backyard
Grand 1443	No backyard
Grand 1712/1714	Gravel backyard
Grand 1929/1931	Gravel backyard
Grand 1933/1935	Backyard gravel, parking lot
Greenwood 1034	Backyard accessed through house only
Iowa 0803	Front yard gravel
Iowa 0805	Front yard consists of flowerbed and garden (tilled)
Iowa 1004	Front yard consists of flowerbed (tilled)
Iowa 1028	Front yard gravel
Iowa 1202	Owners son didn't want sampling done after 1st boring completed
Iowa 1205	2nd boring location consisted of garden and flowerbed
Lee 2019	Gravel backyard
Lee 2161	Front yard gravel

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT
RESIDENTIAL AREA SAMPLING
NL/TARACORP SUPERFUND SITE

Madison 1340	Backyard gravel parking
Madison 1413	Owner could not control dogs in back

PROPERTY IDENTIFICATION NUMBER	**PROBLEMS ENCOUNTERED**
Properties Where Only One Boring Completed (cont'd)	
Madison 1439	Gravel backyard
Maple 1647	Backyard sidewalk and garden
Maple 1709	Not enough front or side yard
Maple 1729	Backyard filled
Niedringhaus 915/915A/917	No front yard or side yard
Niedringhaus 0929	No front yard
Niedringhaus 0931	Gravel backyard
Niedringhaus 0938	Gravel backyard
Ohio 2026	Tilled front yard
Olive 1631	Front yard fill and gravel
Olive 1647/1649	No front yard
State 1310	No backyard
State 1320	No backyard
State 1322	No front yard
State 1716	No backyard
Walnut 1745	No front yard or side yard
Washington 1003A,B	Gravel in backyard
Washington 1005	Front yard gravel

TABLE 11
(CONT'D)

PROPERTY PROBLEMS ENCOUNTERED DURING ADJACENT RESIDENTIAL AREA SAMPLING NL/TARACORP SUPERFUND SITE

Washington 2020	Gravel backyard
Washington 2035	No front yard
Washington 2036A,B,C	Backyard concrete and fill

PROPERTY IDENTIFICATION NUMBER	PROBLEM ENCOUNTERED
Partial Property Sampled (Hand Auger Refusal)	
Eighteenth 1312	Unable to penetrate past 4 in.
Spruce 1646	Unable to take bottom 6 in. of boring 2
Washington 2140	Unable to take 6-12 in. sample in backyard due to old foundation

TABLE 12
Groundwater Sampling Summary
First Groundwater Sampling Event July 1992
NL/Taracorp Superfund Site

WELL NUMBER	FIELD SAMPLES	QUALITY ASSURANCE FIELD DUPLICATE	QUALITY ASSURANCE TRIP BLANKS	QUALITY ASSURANCE MS/MSD	QUALITY ASSURANCE RINSATE BLANKS	QUALITY CONTROL FIELD DUPLICATE	QUALITY CONTROL TRIP BLANKS	QUALITY CONTROL MS/MSD	QUALITY CONTROL RINSATE BLANKS
101	1							1 / 1 *	
104	1							1 / 1 [2]	
106D	1								
107S	1								
107D	1	1							
108D	1					1			
109	1							1 / 1 [3]	
110	1							1 / 1 *	
103-91	1					2 [1]			
104-92	1			1 / 1					
109-92	1	1						1 / 1 *	
111-92	1					1			
112			1						1
113					1		1		
114							1		1
115			1						
Laboratory Control Samples									
SBLK06								1 / 1 **	
BLK01								1 / 1 ***	
BLK02								1 / 1 ***	
Total	12	2	2	1 / 1	1	4	2	NA	2
Frequency (%)		16.67	16.67	8.3 / 8.3	8.3	33.33	16.67	NA	16.67

Sampling included: volatile organics, semi-volatile organics, pesticides, PCB's, and metals.
[1] Field duplicates originally labeled as MS/MSD. No metals analyses.
[2] GFAA metals analysis only
[3] ICP metals analysis only
* Volatile organics Analysis only
** Semi-volatile organics analysis only
*** PCB's and pesticides analysis only

TABLE 13

SAMPLE IDENTIFICATION NOMENCLATURE
NL/TARACORP SUPERFUND SITE

Each sample has a unique sample identification. The identification consists of sample matrix code, street code, lot number, boring number, sample depth code, and sample type. All of the codes are listed in the following tables with their appropriate description. An example follows to demonstrate the operation of the sample identification.

SMP1629200B00L

S	Sample Matrix (In this case, the sample matrix is soil, see **SAMPLE MATRICES** table.)
MP	Street Code (In this case, the sample location is on Maple Street, see **STREET CODE** table.)
1629	Lot Number (In this case, the sample was taken at lot/house number 1629.)
2	Boring Number (In this case, the sample was taken from the 2nd boring on the property.)
00B	Sample Depth (In this case, the sample was taken between 3 - 6 inches from the boring indicated, see **SAMPLE DEPTHS** table.)
00L	Sample Type (In this case, the sample was analyzed for Total Lead, see **SAMPLE TYPES** table.)

SAMPLE MATRICES

S	Soil Sampled for Chemical Analysis &/or Geotechnical
W	Groundwater Sampled from Monitoring Wells

TABLE 13

SAMPLE IDENTIFICATION NOMENCLATURE
NL/TARACORP SUPERFUND SITE

STREET CODES

RESIDENTIAL

AD	ADAMS
AL	ALTON
BE	BENTON
BR	BRYAN
CH	CHESTNUT
CL	CLEVELAND
DE	DELMAR
DV	DENVER
ED	EDISON
EL	ELIZABETH
ER	EDWARDSVILLE ROAD
GR	GRAND
GW	GREENWOOD
IO	IOWA
KE	KENNEDY
LE	LEE
MA	MADISON
MP	MAPLE
MC	McCAMBRIDGE
ME	MEREDOCIA
NI	NIEDRINGHAUS
OH	OHIO
OL	OLIVE
RE	REYNOLDS
RR	ROCK ROAD
SA	SALVETER
SP	SPRUCE
ST	STATE
WA	WALNUT
WS	WASHINGTON
ET	18th
FI	5th
NT	19th
TL	12th
SN	2nd
TW	20th
TS	22nd
WT	W. 20th

INDUSTRIAL AND REMOTE FILL AREAS

BV	BV & G TRANSPORT
OR	OTHER REMOTE FILL AREAS
RO	RICH OIL
TA	TARACORP
TR	TRUST 454
VE	VENICE ALLEYS
CA	CARVER
CO	COLGATE
HA	HARRISON
HI	HILL
RS	ROOSEVELT
TE	TERRY

TABLE 13

SAMPLE IDENTIFICATION NOMENCLATURE
NL/TARACORP SUPERFUND SITE

SAMPLE DEPTH

CODE	DEPTH
00A	0-3 inches
00B	3-6 inches
00C	6-12 inches
00D	1-2 feet
00E	2-3 feet
00F	3-4 feet
00G	4-5 feet
00H	5-6 feet
00I	6-7 feet
00J	0-2 feet
00K	2-4 feet
00L	4-6 feet
00M	6-8 feet
00N	8-10 feet
00P	10-12 feet
00R	12-14 feet
00S	14-15 feet
00T	13-15 feet
00U	10-11 feet
00V	15-16 feet
00W	20-21 feet
00X	25-26 feet
0AB	0-6 inches
0AC	0-1 feet
0GG	Top of Groundwater

TABLE 13

SAMPLE IDENTIFICATION NOMENCLATURE
NL/TARACORP SUPERFUND SITE

SAMPLE TYPE

00G	Geotechnical Sample
0GD	Geotechnical Duplicate
0GQ	Geotechnical QA Sample
00L	Total Lead Sample
0LD	Total Lead Duplicate Sample - Boring 1
0LQ	Total Lead Quality Assurance
0XM	Total Lead, Boring 2, Duplicate - # 1
0XX	Total Lead, Boring 2, Duplicate - # 2
00T	TCLP Lead Sample
0TD	TCLP Lead Duplicate
0TQ	TCLP Lead Quality Assurance
0TM	TCLP Lead Matrix Spike
0TX	TCLP Lead Matrix Spike Duplicate
00W	Groundwater Sample
0WD	Groundwater Duplicate
0WB	Groundwater Rinsate Blank
0WM	Groundwater Matrix Spike
0WX	Groundwater Matrix Spike Duplicate
0WQ	Groundwater QA Sample
0WR	Groundwater QA Matrix Spike
0WS	Groundwater QA Matrix Spike Duplicate
0WT	Groundwater QA Rinsate Blank
0TB	Trip Blank
0RS	Re-Sample

DATA QUALIFIER CODES

U The compound was analyzed for but was not detected. The associated numerical value is attributed to contamination and is considered to be the sample quantitation limit.

J The associated numerical value is an estimated quantity.

UJ The compound was analyzed for but was not detected. The sample quantitation limit is an estimated quantity.

R The data are unusable (whether the compound is present or not). Resampling and reanalysis are necessary for verification.

TABLE 14
PERSONAL AIR SAMPLING MONITORING RESULTS
NL/TARACORP SUPERFUND SITE

SAMPLE ID	SAMPLE NO. DATE	TASK	TOTAL LEAD EXPOSURE LEVEL (mg/m^3)	REPORTING LIMIT (mg/m^3)
PASP #1	11/4/92	HAB Team	<R.L.	0.0002
PASP #2	11/4/91	HAB Team	0.0002	0.0002
PASP #3	11/4/91	HAB Team	<R.L.	0.0002
PASP #4	11/4/91	HAB Team	<R.L.	0.0002
PASP #6	11/15/91	Drilling Rig	0.00023	0.00014
PASP #7	11/15/91	Drilling Rig	0.00022	0.00014
PASP #8	11/15/91	Drilling Rig	<R.L.	0.00013
PASP #9	11/15/91	Drilling Rig	0.00078	0.00013
PASP #10	11/15/91	Field Blank	<R.L.	0.00013
PASP #11	11/22/91	Drilling Rig	0.00077	0.00017
PASP #12	11/22/91	Drilling Rig	0.0026	0.00017

Comments:

1. Personal air monitoring results compared to 8-hr OSHA permissible exposure limit (PEL) = 0.05 mg/m^3 for lead.

2. Sample data represents date sample collection began. Most samples taken over 2 days for 8-hr. collection period.

TABLE 15
LABORATORY QC LEVEL OF EFFORT FOR ANALYTICAL TESTING
NL/TARACORP SUPERFUND SITE

SOIL ANALYSES

Parameters	Audit	Frequency[1]
Total Lead (ICP and AA)	Initial and Continuing Calibration Verification	Daily and each instrument setup
	Laboratory Control Sample	One per batch or one per 20 samples
	Matrix Blank/Matrix Spike Analysis	One per batch or one per 20 samples
	Laboratory Replicate	One per batch or one per 20 samples
	Interference Check Sample (ICP)	One per batch or one per 20 samples
TCLP - Lead	Laboratory Control Sample	One per batch or one per 20 samples
	Matrix Method Analysis	One per batch or one per 20 samples
	ICP and AA QC level of effort. Same as above for total lead.	

GROUNDWATER ANALYSES

Parameters	Audit	Frequency[1]
Metals	Calibration Blank (ICP and AA)	Each calibration, beginning and end of each run
	Initial Calibration Verification (ICP and AA)	Daily and each instrument setup
	Continuing Calibration Verification (ICP and AA)	One per 10 samples
	Preparation Blank (ICP and AA)	One per batch or one per 20 samples
	Matrix Spike Analysis (ICP and AA)	One per batch or one per 20 samples
	Duplicate Sample Analysis (ICP and AA)	One per batch or one per 20 samples
	Laboratory QC Sample Analysis (ICP and AA)	Each sample (at least a single analytical spike will be performed to determine if the method of standard addition is required for quantitation)
	Duplicate Injections (AA-Furnace)	One per batch or one per 20 samples
	Interference Check Sample (ICP)	Beginning and end of each run or one per 8-hr shift

TABLE 15 (cont'd)

LABORATORY QC LEVEL OF EFFORT FOR ANALYTICAL TESTING
NL/TARACORP SUPERFUND SITE

GROUNDWATER ANALYSES

Parameters	Audit	Frequency[1]
Metals (cont'd)	Serial Dilution Analysis (ICP)	Only if concentration a factor of 10 above the instrumental detection limit in the original sample.
Organic (GC/MS) VOC, SVOC	Initial and Continuing Calibration Verification	One per day at the beginning of the day and at the beginning of each 12-hour shift for VOC and SVOC
	Matrix Spike Analysis	One per batch or one per 20 samples
	Matrix Spike Duplicate Analysis	One per batch or one per 20 samples
	Surrogate Spike	Each sample
	Reagent Water Blank	Daily for VOC. Day of extraction or one per 20 samples for SVOC
PCB's & Pesticides (GC/ECD)	Instrument Lineation Verification	Each run and every 72 hours of continuous operation
	Continuing Verification	Each target compound or one per each 10 samples
	Matrix Spike Analysis	One per batch or one per 20 samples
	Matrix Spike Duplicate Analysis	One per batch or one per 20 samples
	Surrogate Spike	Each sample
	Duplicate Sample Analysis	Analysis conducted if a target compound is detected in sample
	Reagent Water Blank	Each day of extraction or one per 20 samples

Note:
(1) QC audits are to be performed at most frequent interval specified.
TCLP Toxicity Characteristics Leachate Procedure
AA Atomic Absorption
ICP Inductively Coupled Argon Plasma
GC/MS Gas Chromatography/ Mass Spectrophotometry
GC/ECD Gas Chromatography/ Electron Capture Detector

TABLE 16
ACCURACY AND PRECISION CRITERIA FOR ANALYTICAL TESTING

NL/TARACORP SUPERFUND SITE

SOIL ANALYSES

Parameters	Audit	Control Limits
Total Lead	Initial Calibration Verification	75-125%
	Continuing Calibration Verification	75-125%
	Matrix Blank/Matrix Spike Analysis	75-125%
	Matrix Duplicate Sample Analysis	<20% RPD
	Laboratory Control Sample(2)	<20% RPD
	Interference Check Sample (ICP)	± 10%
TCLP-Lead	Laboratory Control Sample	<20% RPD
	Matrix Blank	75-125%

GROUNDWATER ANALYSES

Parameters	Audit	Control Limits
Metals		
Atomic Absorption	Calibration Blank	< CRDL
	Initial Calibration Verification	90-110%
	Continuing Calibration Verification	90-110%
	Preparation Blank	< CRDL
	Matrix Spike Analysis	75-125%
	Lab Duplicate Sample Analysis	± CRDL or <20% RPD
	Laboratory Control Sample(2)	80-120%
	Duplicate Injections	<20% RPD
ICP	Calibration Blank	< CRDL
	Initial Calibration Verification	90-110%
	Continuing Calibration Verification	90-110%
	Preparation Blank	< CRDL
	Matrix Spike Analysis	75-125%
	Lab Duplicate Sample Analysis	± CRDL or <20% RPD
	Laboratory Control Sample(2)	80-120%
	Interference Check Sample	80-120%
	Serial Dilution Analysis(4)	<10% D

TABLE 16 (cont'd)
ACCURACY AND PRECISION CRITERIA FOR ANALYTICAL TESTING

NL/TARACORP SUPERFUND SITE

GROUNDWATER ANALYSES

Parameters	Audit	Control Limits
Volatile and Extractable Organic Compounds		
GC/MS	Initial Calibration Verification	<30% RSD
	Continuing Calibration Verification	<25% D
	Reagent Blank(3)	< CRDL
	Matrix Spike/ Matrix Spike Duplicate Analysis	(1)
	Surrogate Spike	(1)
PCB's and Pesticides		
GC/ECD	Instrument Lineation Verification	<10% RSD
	Continuing Verification	(5)
	Duplicate Sample Analysis	±CRDL or <20% RPD
	Reagent Water Blank	< CRDL

Notes:

(1) Matrix and surrogate spike recovery limits are shown in Table 17.

(2) If % R falls outside control limits, the analyses must be terminated, the problem corrected, and the previous samples associated with that LCS redigested and reanalyzed.

(3) SW-846 protocol allows for certain laboratory contaminants to be up to 5 times the CRDL. These laboratory contaminants will be flagged as such.

(4) If dilution analysis is >10%, a chemical or physical interference must be suspected, and the data for all affected analytes is flagged with an "E".

(5) Target compound matrix spike analysis must be within RPD criteria listed in Table 17.

AA	Atomic Absorption
ICP	Inductively Coupled Argon Plasma
GC/MS	Gas Chromatography/ Mass Spectrophotometry
GC/ECD	Gas Chromatography/ Electron Capture Detector
TCLP	Toxicity Characterstics Leachate Procedure
LTE	Less than or equal to
RPD	Relative Percent Difference
CRDL	Contract Required Detection Limit
%D	Percent Difference
LCS	Laboratory Control Sample
%RSD	Percent Relative Standard Deviation

TABLE 17
MATRIX AND SURROGATE SPIKE[1]
CONTROL LIMITS FOR ORGANIC ANALYSIS
NL/TARACORP SUPERFUND SITE

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Fraction	Compound	Water (%)[2] Recovery Limits	Water (%)[2] RPD
VOA	1,1-Dichloroethene	61-145	14
VOA	Trichloroethene	71-120	14
VOA	Chlorobenzene	75-130	13
VOA	Toluene	76-125	13
VOA	Benzene	76-127	11
BN	1,2,4-Trichlorobenzene	39-98	28
BN	Acenaphthene	46-118	31
BN	2,4-Dinitrotoluene	24-96	38
BN	Pyrene	26-127	31
BN	N-Nitroso-di-n-propylamine	41-116	38
BN	1,4-Dichlorobenzene	36-97	28
Acid	Pentachlorophenol	9-103	50
Acid	Phenol	12-89	42
Acid	2-Chlorophenol	27-123	40
Acid	4-Chloro-3-methylphenol	23-97	42
Acid	4-Nitrophenol	10-80	50
Pest	Lindane	56-123	15
Pest	Heptachlor	40-131	20
Pest	Aldrin	40-120	22
Pest	Dieldrin	52-126	18
Pest	Endrin	56-121	21
Pest	4,4-DDT	38-127	27

TABLE 17
(Continued)
MATRIX AND SURROGATE SPIKE[1]
CONTROL LIMITS FOR ORGANIC ANALYSIS
NL/TARACORP SUPERFUND SITE

SURROGATE SPIKE

		Recovery Limits (%)
Fraction	**Compound**	**Water**
VOA	Toluene-d_8	88-110
VOA	4-Bromofluorobenzene	86-115
VOA	1,2-Dichloroethane	76-114
BN	Nitrobenzene-d_5	35-114
BN	2-Fluorobiphenyl	43-116
BN	p-Terphenyl-d14	33-141
Acid	Phenol-d_6	10-94
Acid	2-Fluorophenol	21-100
Acid	2,4,6-Tribromophenol	10-123
Pesticide	Tetrachloro-m-xylene	60-150

Notes:

(1) Spike levels were in accordance with SW-846.
(2) These limits for matrix spike analyses are for advisory purposes only and will not be used to determine if a sample should be reanalyzed.

VOA = Volatile Organic Reagent
BN = Base/Neutral Reagent (semi-volatile)
Acid = Acid Reagent (semi-volatile)
Pest = Pesticide Reagent

TABLE 18
LABORATORY COMPLETENESS
NL/TARACORP SUPERFUND SITE

ANALYSIS	METHOD	NUMBER OF SAMPLES	NUMBER OF ANALYSES REJECTED
Soil			
Total Lead	6010 or 7420	5499	0
TCLP-Lead	6010 or 7420	70	0
Total Soil Samples		5560	0
Soil Analysis Completeness: (Total valid samples/ Total samples analyzed)	= 100%		
Groundwater			
Volatile Organics	8240	20	0
Semivolatile Organics	8270	18	3
PCB's and Pesticides	8080	18	0
Metals	6010 7421 7060 7740 7470	16 16 16 16 16	0 0 0 0 0
Total Groundwater Samples:		136	3
Groundwater Analysis Completeness: (Total valid samples/ Total samples analyzed)	= 97.8%		

TABLE 19
ANALYTICAL METHODS AND REPORTING LIMITS
NL/TARACORP SUPERFUND SITE

SOIL ANALYSES

Analyte		Reporting Limit[1]
Total Lead	Method 6010/7420	5 mg/kg
TCLP - Lead	Method 1311/6010	0.65 mg/L
	Method 1311/7420	0.20 mg/L

GROUNDWATER ANALYSES

VOLATILE ORGANICS METHOD 8240

Analyte	CAS Number	Reporting Limit Water Samples (ug/L)
Acrolein	107-02-8	100
Acrylonitrile	107-13-1	50
Benzene	71-43-2	5
Bromodichloromethane	75-27-4	5
Bromoform	75-25-2	5
Bromomethane	74-83-9	10
Carbon Tetrachloride	56-23-5	5
Chlorobenzene	108-90-7	5
Chloroethane	75-00-3	10
Chloroform	67-66-3	5
2-Chloro ethyl vinyl ether	110-75-8	20
Chloromethane	74-83-9	10
Dibromochloromethane	124-48-1	5
1,1-Dichloroethane	75-34-3	5

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

VOLATILE ORGANICS (Cont'd)

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
1,2-Dichloroethane	107-06-2	5
1,1-Dichloroethene	75-35-4	5
1,2-Dichloroethane (Total)	540-59-0	5
1,2-Dichloropropane	78-87-5	5
trans-1,3-Dichloropropene	10061-02-6	5
Ethyl Benzene	100-41-4	5
Methylene Chloride (dichloromethane)	75-09-2	5
Tetrachloroethene	127-18-4	5
1,1,1-Trichloroethane	71-55-6	5
1,1,2-Trichloroethane	79-00-5	5
Trichloroethene	79-01-6	5
Vinyl Chloride	75-01-4	10

ADDITIONAL VOLATILE ORGANICS TESTED (Method 8240)

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
Acetone	67-64-1	10
Carbon Disulfide	75-15-0	5
2-Butanone	78-93-3	10
Vinyl Acetate	108-05-4	10
cis-1,3-Dichloropropene	10061-01-5	5
4-Methyl-2-Pentanone	108-10-1	5
2-Hexanone	591-78-6	10
1,1,2,2-Tetrachloroethane	79-34-5	5
Toluene	108-88-3	5
Styrene	100-42-5	5
Xylene (Total)	1330-02-7	5

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

SEMIVOLATILE ORGANICS METHOD 8270

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
Acenaphthene	83-32-9	10
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	10
Benzidine	92-87-5	50
Benzo(a)anthracene	56-55-3	10
Benzo(a)pyrene	50-32-8	10
Benzo(b)fluoranthene	205-99-2	10
Benzo(g,h,i) perylene	191-24-2	10
Benzo(k)fluoranthene	207-08-9	10
4-Bromophenyl-phenylether	101-55-3	10
Butylbenzylphthalate	85-68-7	10
Bis(2-Chloroethoxy)methane	111-91-1	10
Bis(2-chloroethyl)ether	111-44-4	10
Bis-(2-chloroisopropol)-ether	108-60-1	10
4-Chloroaniline	106-47-8	5
2-Chloronaphthalene	91-58-7	10
.2-Chlorophenol	95-57-8	10
4-Chlorophenyl-phenylether	7005-72-3	10
4-Chloro-3-methylphenol	59-50-7	10
Chrysene	218-01-9	10
Di-n-butylphthalate	84-74-2	10
Di-n-octylphthalate	117-84-0	10
Dibenz(a,h)anthracene	53-70-3	10
1,2-Dichlorobenzene	95-50-1	10
1,3-Dichlorobenzene	541-73-1	10

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

SEMIVOLATILE ORGANICS METHOD 8270 (Cont'd)

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
1,4-Dichlorobenzene	106-46-7	10
3,3'-Dichlorobenzidine	91-94-1	20
2,4-Dichlorophenol	120-83-2	10
Diethylphthalate	84-66-2	10
2,4-Dimethylphenol	105-67-9	10
Dimethyl phthalate	131-11-3	5
4,6-Dinitro-2-methylphenol	534-54-1	50
2,4-Dinitrophenol	51-28-5	50
2,4-Dinitrotoluene	121-14-2	10
2,6-Dinitrotoluene	606-20-2	10
1,2-Diphenylhydrazine	122-66-7	20
bis(2-Ethylhexyl)phthalate	117-81-7	10
Fluoranthene	206-44-0	10
Fluorene	86-73-7	10
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	87-68-3	10
Hexachlorocyclopentadiene	77-47-4	10
Hexachloroethane	67-72-1	10
Indeno(1,2,3-c,d)pyrene	193-39-5	10
Isophorone	78-59-1	10
Naphthalene	91-20-3	10
Nitrobenzene	98-95-3	10
2-Nitrophenol	88-75-5	10
4-Nitrophenol	100-02-7	50
N-Nitrosodimethylamine	62-75-9	50

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

SEMIVOLATILE ORGANICS METHOD 8270 (Cont'd)

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
N-Nitrosodiphenylamine	86-30-6	10
N-Nitroso-di-n-propylamine	621-64-7	10
Pentachlorophenol	87-86-5	50
Phenanthrene	85-01-8	10
Phenol	108-95-2	5
Pyrene	129-00-0	10
1,2,4-Trichlorobenzene	120-82-1	10
2,4,6-Trichlorophenol	88-06-2	10

ADDITIONAL SEMIVOLATILE ORGANICS TESTED (Method 8270)

Benzyl Alcohol	100-51-6	10
2-Methylphenol	95-48-7	10
4-Methylphenol	106-44-5	10
Benzoic Acid	65-85-0	50
2-Methylnaphthalene	91-57-6	10
2,4,5-Trichlorophenol	95-95-4	50
2-Nitroaniline	88-74-4	50
3-Nitroaniline	99-09-2	50
Dibenzofuran	132-64-9	10
4-Nitroaniline	100-01-6	50

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

Analyte	CAS Number	Reporting Limit[1] Water Samples (ug/L)
PESTICIDES AND PCBS - METHOD 8080		
Aldrin	309-00-2	0.005
BHC-alpha	319-84-6	0.005
BHC-beta	319-85-7	0.005
BHC-delta	319-86-8	0.005
BHC-gamma (Lindane)	58-89-9	0.005
DDD,4,4-	72-54-8	0.01
DDE,4,4-	72-55-9	0.01
DDT,4,4-	50-29-3	0.01
Dieldrin	60-57-1	0.01
Endosulfan Sulfate	1031-07-8	0.01
Endosulfan, a-	959-98-8	0.005
Endosulfan, b-	33212-65-9	0.01
Endrin	72-20-8	0.01
Endrin aldehyde	7421-93-4	0.01
Heptachlor	76-44-8	0.005
Heptachlor epoxide	1024-57-3	0.005
Aroclor-1016	12674-11-2	0.1
Aroclor-1242	53469-21-9	0.1
Aroclor-1254	11097-69-1	0.1
Arodor-1260	11096-82-5	0.1
Toxaphene	8001-35-2	0.5
Alpha-Chlordane	5103-71-9	0.005
Gamma-Chlordane	5103-74-2	0.005

TABLE 19
(Cont'd)

GROUNDWATER ANALYSES

ADDITIONAL PESTICIDES AND PCBs TESTED

Analyte	Methods	Reporting Limit[1] Water Samples ug/L
Methoxychlor	72-43-5	0.05
Endrin Ketone	53494-70-5	0.01
Aroclor-1221	11104-28-2	0.2
Aroclor-1232	11141-16-5	0.1
Arclor-1248	12672-29-6	0.1

METALS

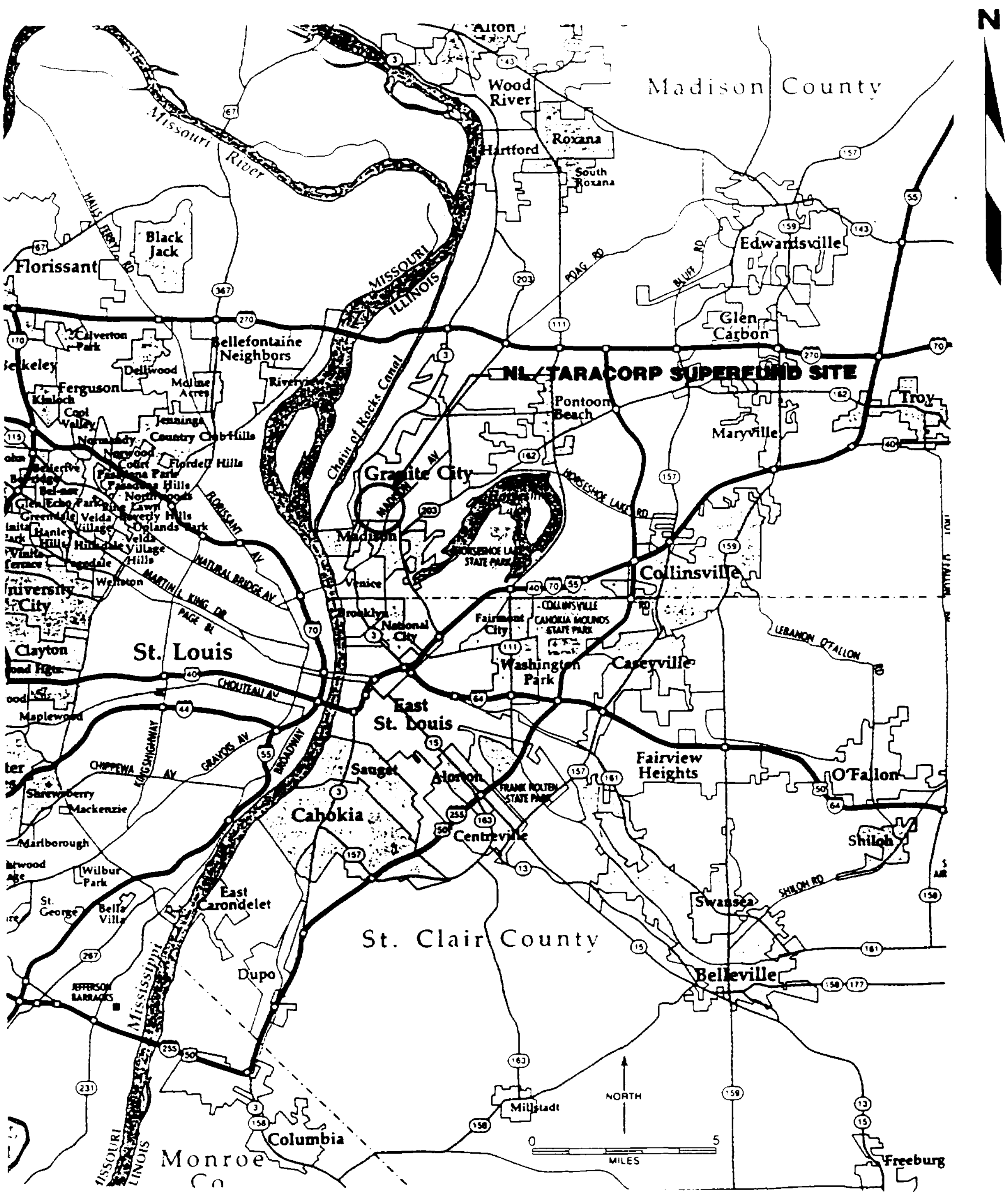
Analyte	Methods	Reporting Limit[1] Water Samples ug/L
Antimony	6010 (ICP)	2
Arsenic	7060 (GFAA)	3.0
Beryllium	6010 (ICP)	0.6
Cadmium	6010 (ICP)	0.3
Chromium (total)	6010 (ICP)	2
Copper	6010 (ICP)	14
Lead	7421 (GFAA)	2.0
Mercury	7470 (CVAA)	0.2
Nickel	6010 (ICP)	23
Selenium	7740 (GFAA)	3.0
Silver	6010 (ICP)	0.4
Thallium	6010 (ICP)	2.0
Zinc	6010 (ICP)	20

Notes:
ICP = Inductively Coupled Argon Plasma Spectrometry
GFAA = Graphite Furnace Atomic Absorption Spectrometry
CVAA = Cold Vapor Atomic Absorption Spectrometry
TCLP = Toxicity Characterstics Leachate Procedure
(1) The Reporting Limit was set at a level above that the laboratory is confident the analyte would be detected and qualified consistently. The reporting limits established are generally between 2 to 5 time the laboratory method detection limit for organics and the instrument detection limit for metals.

TABLE 21
SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES
NL/TARACORP SUPERFUND SITE

Method	Parameter	Type of Sample	Number of Containers Per Sample	Minimum Sample Size	Preservation	Holding Time
3051/6010 or 7420	Total Lead	Soil	4 oz wide mouth polyjar with Teflon lined lid	10 g	4°C	6 months
1311/3010/ 6010 or 7420	TCLP Lead	Soil	4 oz wide mouth poly jar with Teflon lined lid	10 g	4°C	6 months
8240	**Volatiles**	**Water**	**3 x 40 mL viuals Teflon lined septum caps**	**120 mL**	**HCI to pH < 2 4°C**	**14 days**
3510/8270	Semi-Volatiles	Water	2 x 1L glass with Teflon lined cap	2 L	4°C	7 days (Before Extraction)/14 days (Extraction to Analysis)
3510/8080	PCB/Pest.	Water	2 x 1L glass with Teflon lined cap	2 L	Nitric Acid to pH < 2 & 4°C	7 days (Before Extraction)/40 days (Extraction to Analysis)
3005/6010	Metals	Water	1L Poly*	1L*	Nitric Acid to pH < 2 & 4°C	6 months
3020/7421	Lead	Water	1L Poly*	1L*	Nitric Acid to pH < 2 & 4°C	6 months
3020/7060	Arsenic	Water	1L Poly*	1L*	Nitric Acid to pH < 2 & 4°C	6 months
3020/7740	Selenium	Water	1L Poly*	1L*	Nitric Acid to pH < 2 & 4°C	6 months
7470	Mercury	Water	1L Poly*	1L*	Nitric Acid to pH < 2 & 4°C	28 days

*NOTE: The analysis for the Metals, Lead, Arsenic, Selenium, and Mercury use the same one liter poly bottle.



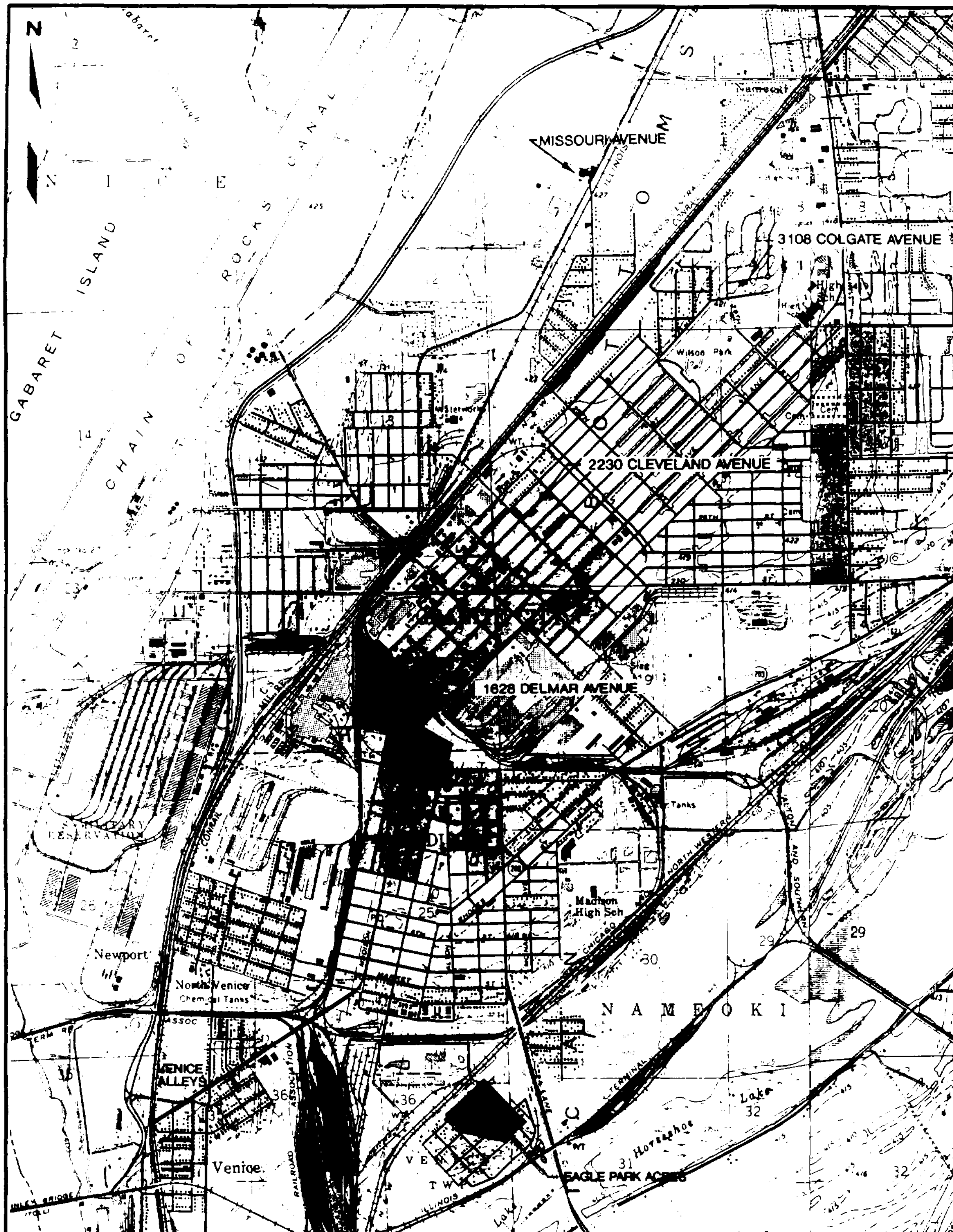
Site Location

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO. 89MC114V

Woodward·Clyde Consultants

CONSULTING ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

DRN. BY: kmm 7/16/91 CHKD. BY:	Site Location Map	FIG. NO. 1



LEGEND

- REMOTE FILL AREAS
- INDUSTRIAL AREAS
- RESIDENTIAL AREAS

SCALE 1:24 000

1 MILE — 0 — 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

NOTE: Drawing taken from U.S.G.S - Granite City, IL-MO, 1982 and Monks Mound, IL, 1974

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO. 89MC114V

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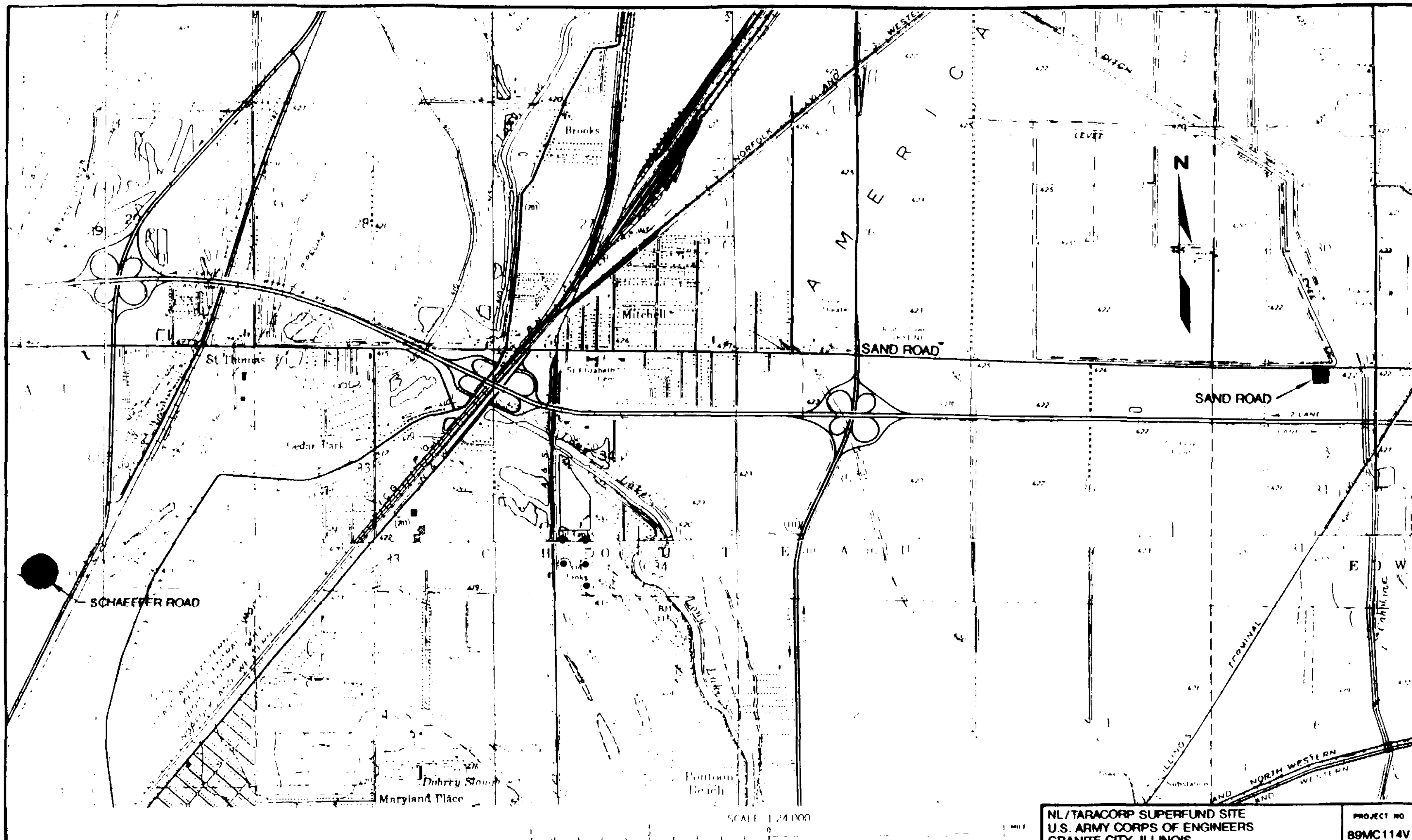
DRN BY kmm 9/9/92 CHKD BY	Site Plan South



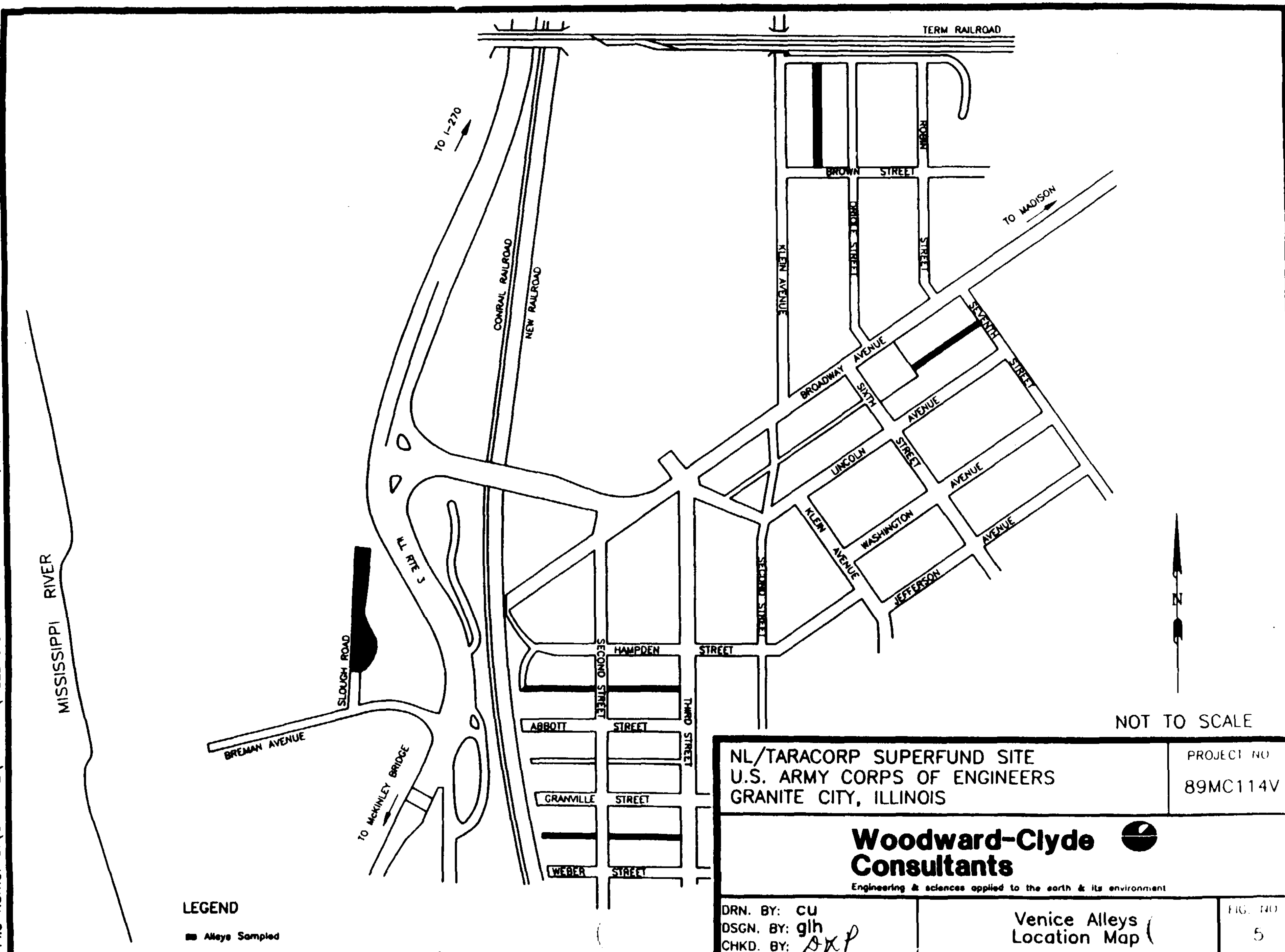
LEGEND

■ REMOTE FILL AREAS

NOTE: Drawing taken from U.S.G.S. Columbia Bottom, MO-IL 1974; Wood River, IL-MO 1974, Monks Mound, IL 1974, Granite City, IL-MO 1982

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO 89MC114V
Woodward-Clyde Consultants CONSULTING ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS	
DRN BY kmm 7/22/91 CHKD BY	Site Plan North — FIG NO 3

File name: G:\GRANITE\TASK45\ALLEYS.DWG Last edited: 92/09/23 @ 09:17



NL/TARACORP SUPERFUND SITE
U.S. ARMY CORPS OF ENGINEERS
GRANITE CITY, ILLINOIS

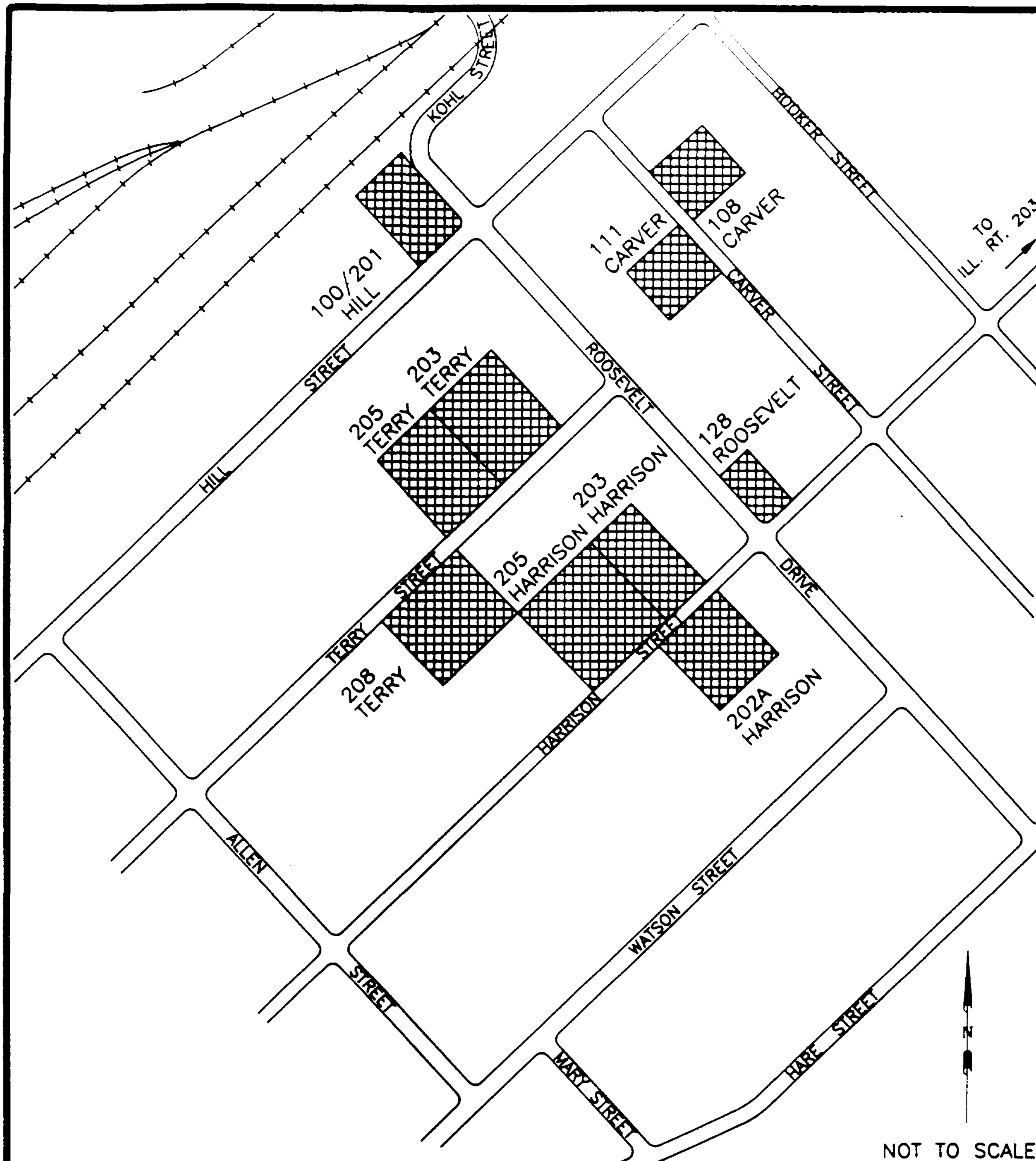
PROJECT NO 89MC114V

Woodward-Clyde Consultants
Engineering & sciences applied to the earth & its environment

DRN. BY: cu
DSGN. BY: glh
CHKD. BY: DKP

Venice Alleys Location Map

FIG. NO 5



NOT TO SCALE

LEGEND

SAMPLED AREAS

NOTE:

1. MAP BASED ON 1983 MADISON COUNTY TAX ASSESOR'S AERIAL PHOTOGRAPHS

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO. 89MC114V

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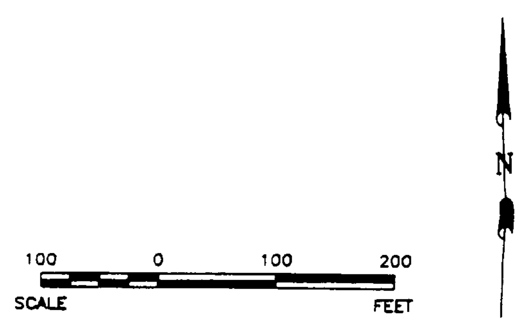
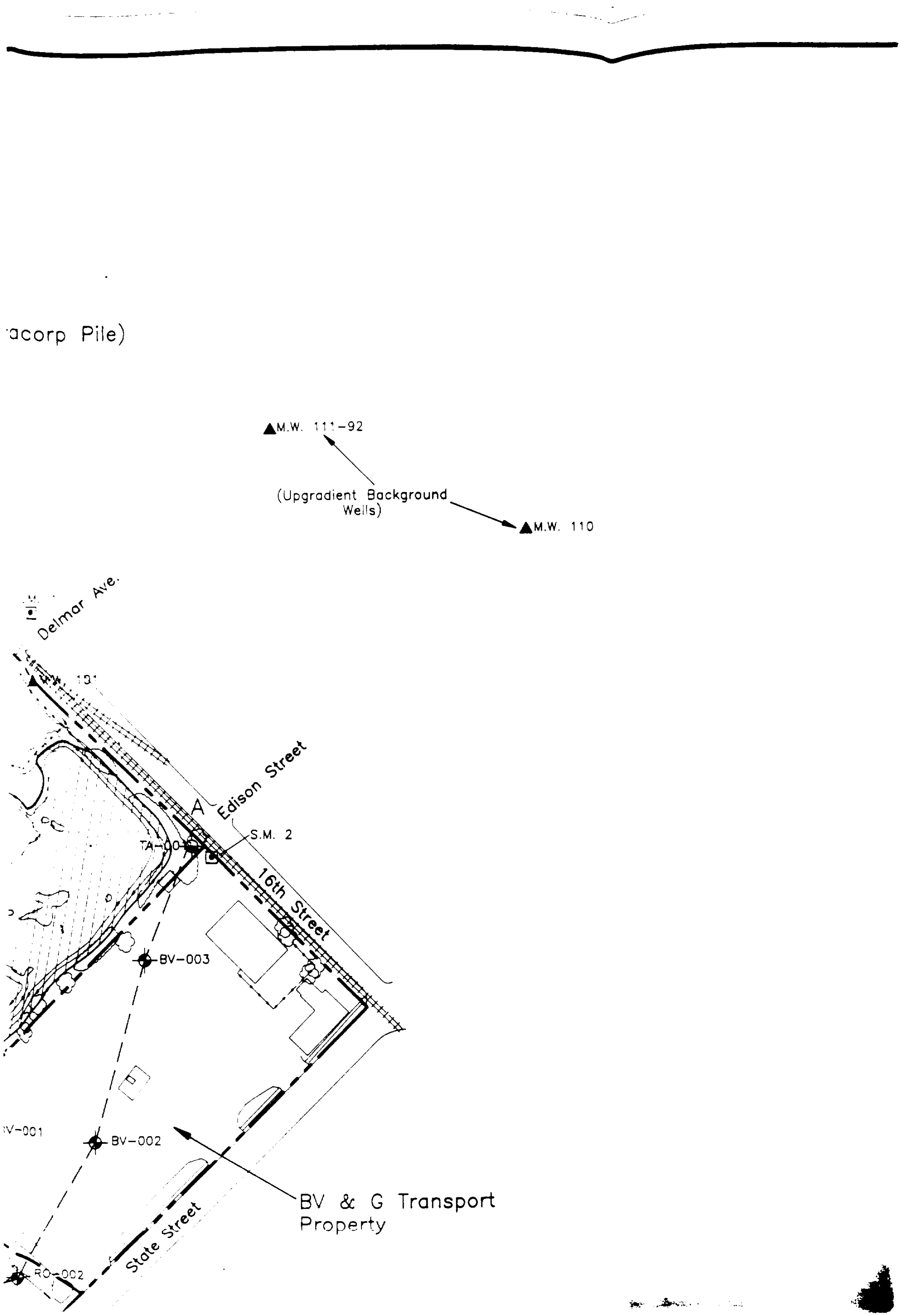
DRN. BY: cu DSGN. BY: glh CHKD. BY:	EAGLE PARK ACRES LOCATION MAP	FIG. NO. 6

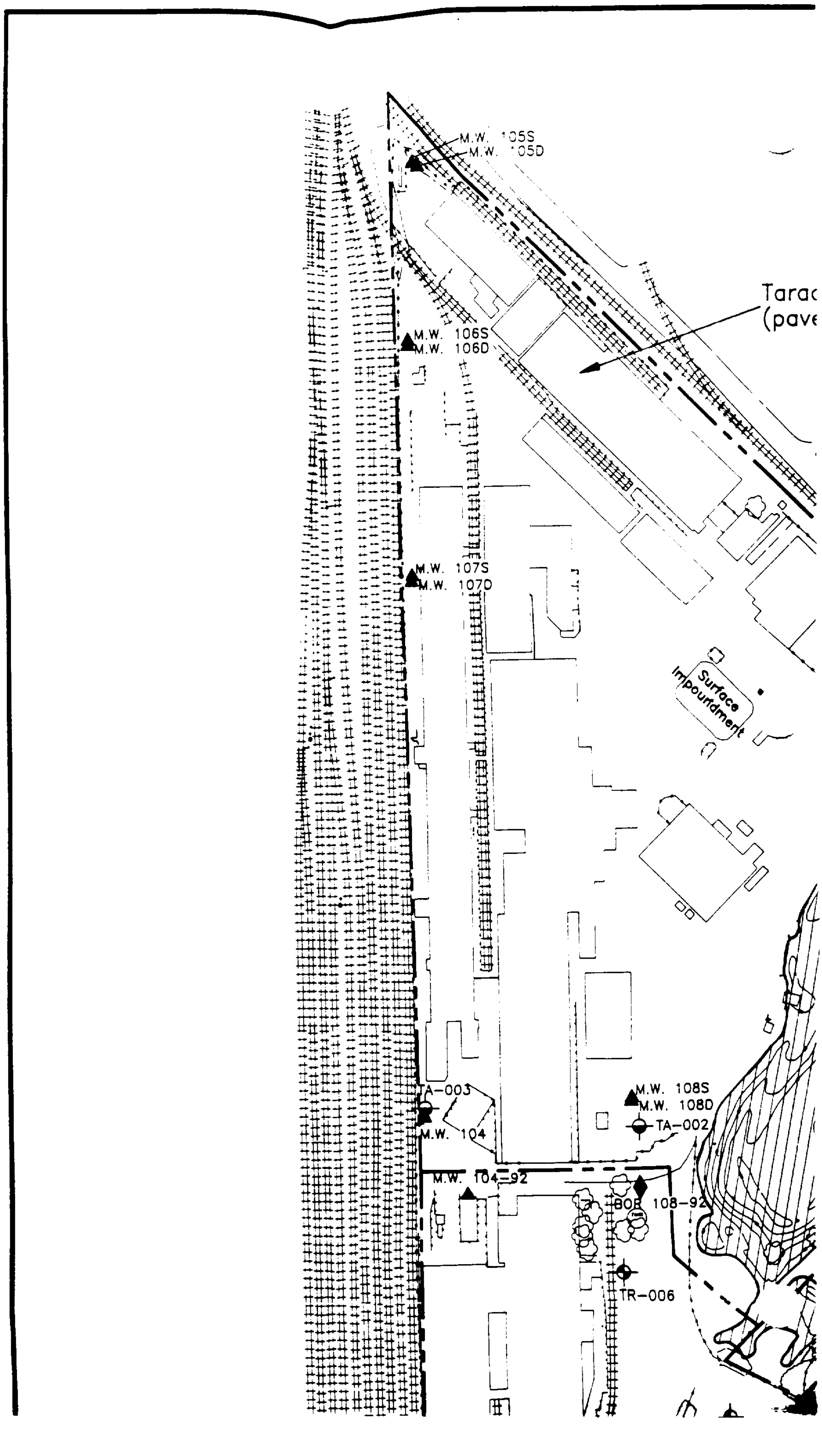
File name: D:\89MC114V\TASK45\BLOCK.DWG Last edited. 92/09/18 @ 13:11

LEGEND

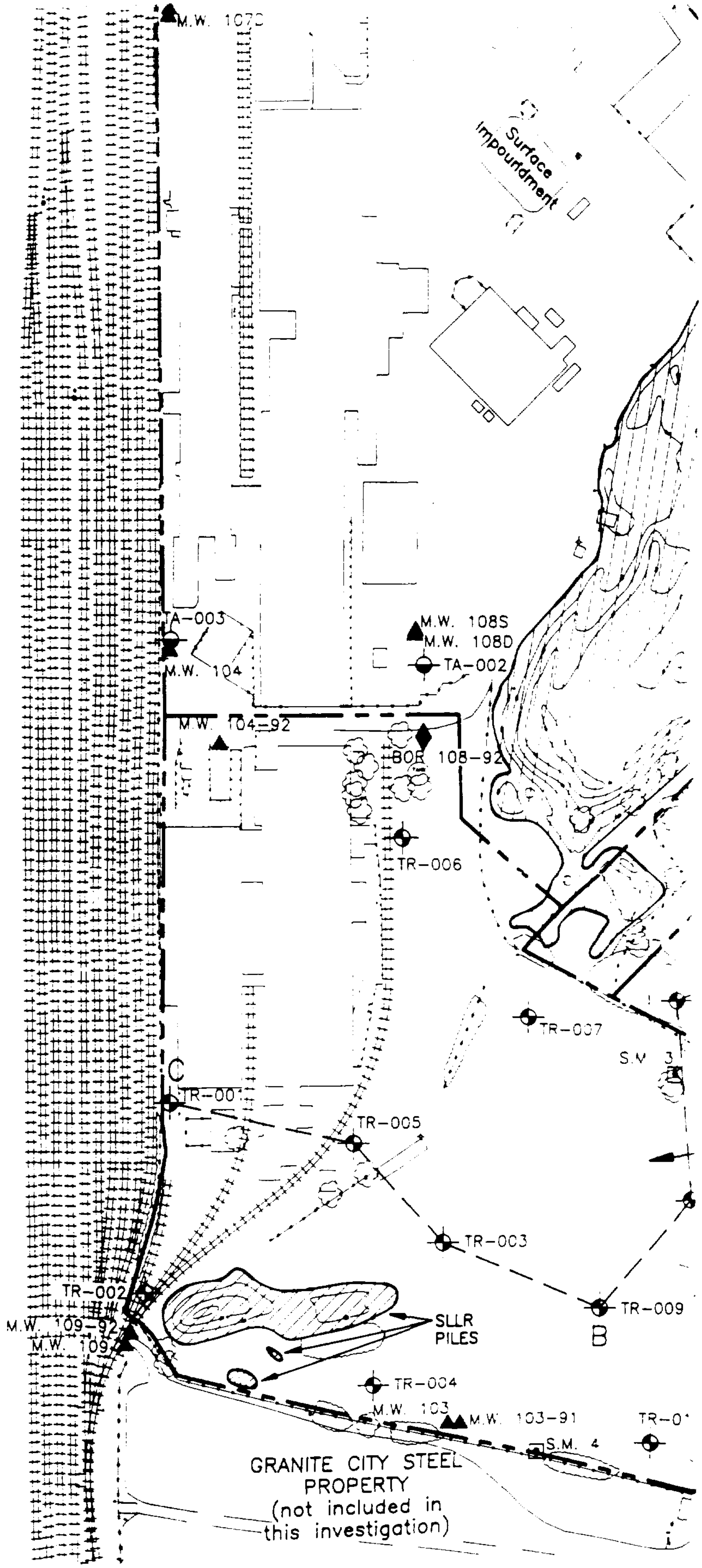
BV-001	DENOTES ANALYTICAL BORING
TA-002	DENOTES GEOTECHNICAL BORING
M.W. 108S	DENOTES MONITORING WELL
BOR 108-92	DENOTES ATTEMPTED MONITORING WELL (SOIL SAMPLES COLLECTED)
S.M. 1	DENOTES SURVEY MONUMENT
	DENOTES PROPERTY LINE
	DENOTES CROSS-SECTION LINE



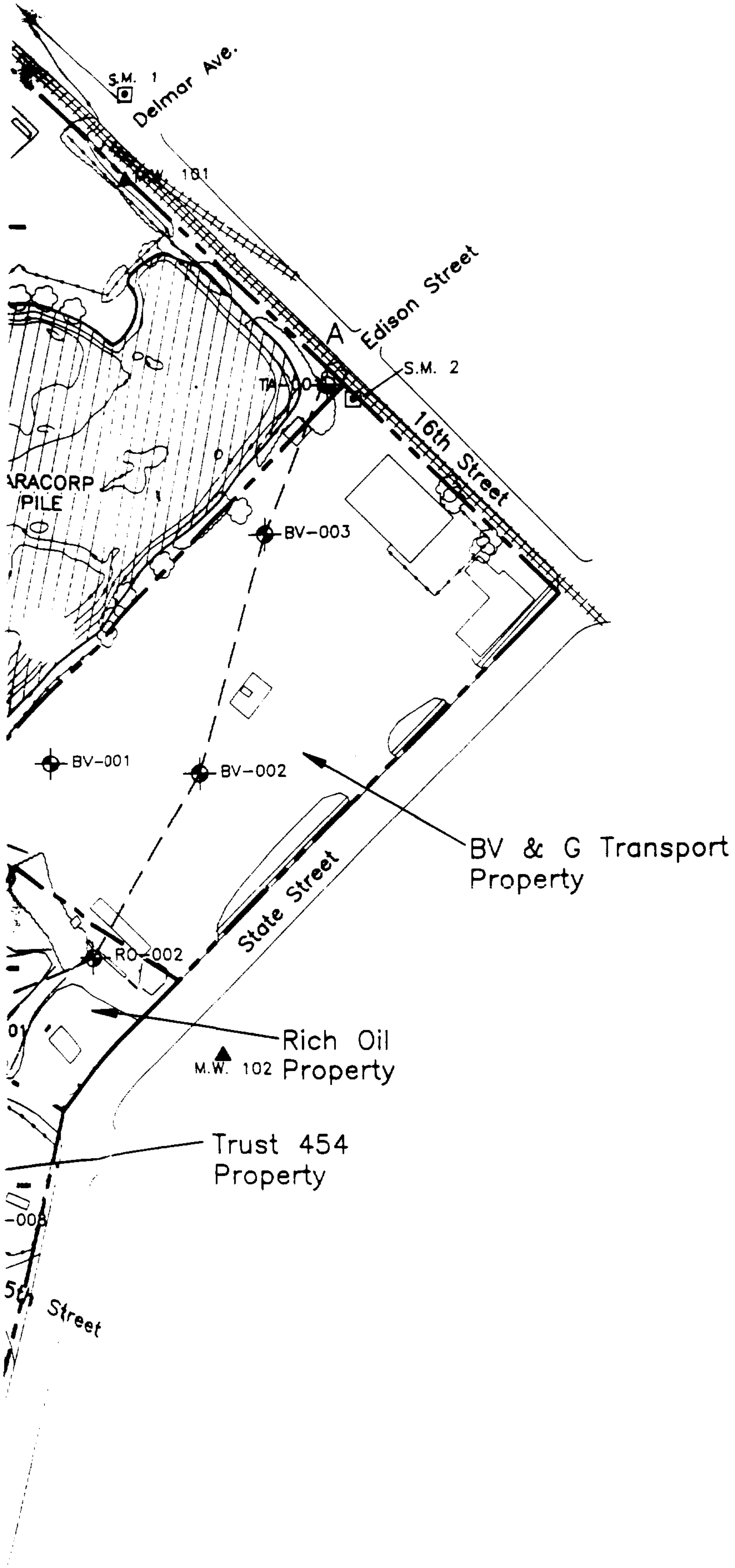

acorp Pile)
M.W. 111-92
(Upgradient Background Wells)
M.W. 110
Delmar Ave.
Edison Street
A
S.M. 2
16th Street
BV-003
BV-002
V-001
BV & G Transport Property
State Street
RO-002

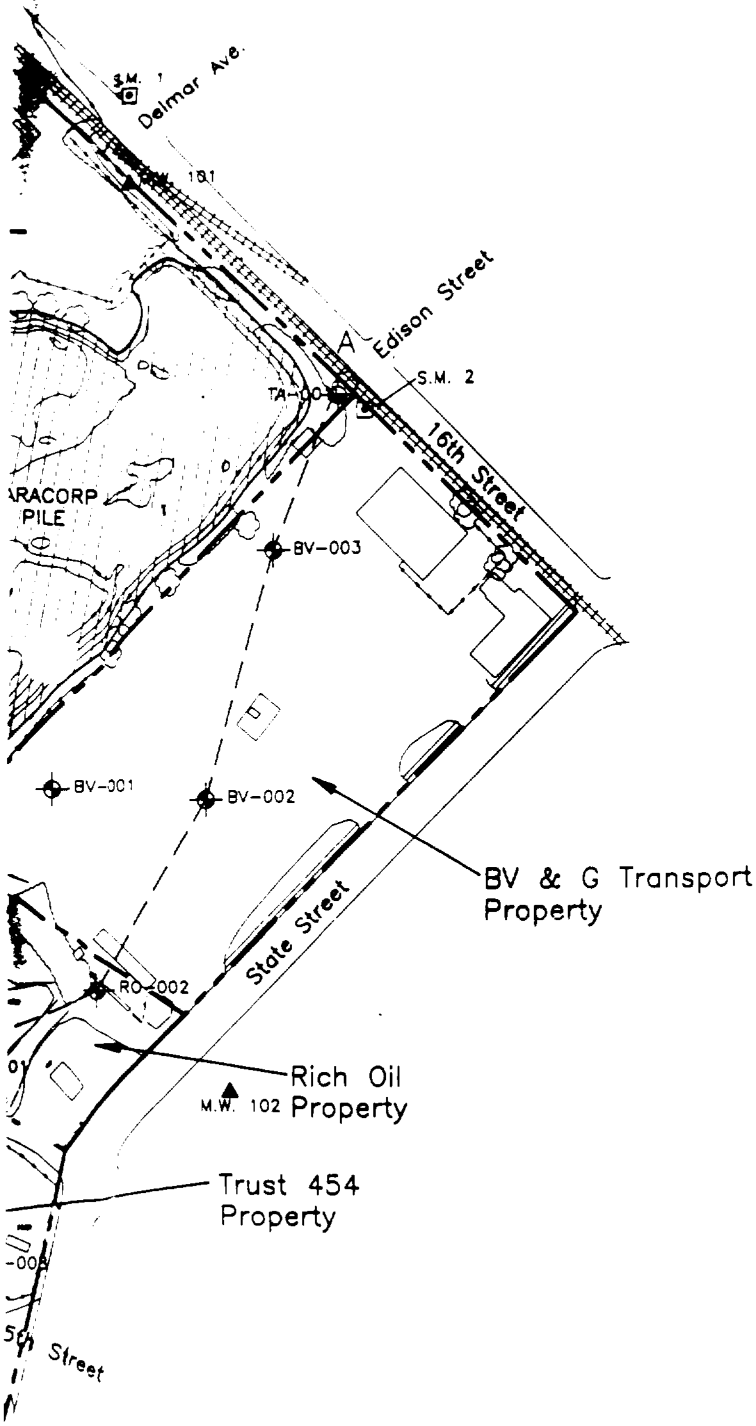


M.W. 105S
M.W. 105D
Tarac
(pave
M.W. 106S
M.W. 106D
M.W. 107S
M.W. 107D
Surface
Impoundment
M.W. 108S
M.W. 108D
TA-003
TA-002
M.W. 104
M.W. 104-92
BOB 108-92
TR-006



M.W. 107S
Surface Impoundment
TA-003
M.W. 104
M.W. 108S
M.W. 108D
TA-002
M.W. 104-92
BOR 108-92
TR-006
TR-007
S.M. 3
C
TR-001
TR-005
TR-003
TR-009
B
TR-002
M.W. 109-92
M.W. 109
SLLR PILES
TR-004
M.W. 103
M.W. 103-91
S.M. 4
GRANITE CITY STEEL PROPERTY (not included in this investigation)


S.M. 1
Delmar Ave.
Edison Street
A
S.M. 2
16th Street
ARACORP
PILE
BV-003
BV-001
BV-002
BV & G Transport
Property
State Street
RO-002
Rich Oil
Property
M.W. 102
Trust 454
Property
Street


S.M. 1
Delmar Ave.
101
Edison Street
A
S.M. 2
TA-001
16th Street
ARACORP
PILE
BV-003
BV-001
BV-002
BV & G Transport
Property
State Street
RO-002
Rich Oil
Property
M.W. 102
Trust 454
Property
5th Street

M.W. 108S DENOTES MON[illegible]

BOR 108-92 DENOTES ATTEMPTED MONITORING WELL (SOIL SAMPLES COLLECTED)

S.M. 1 DENOTES SURVEY MONUMENT

DENOTES PROPERTY LINE

DENOTES CROSS-SECTION LINE

N

100 0 100 200

SCALE FEET

Revision No.	Description	Date	By	App.

REVISIONS

NL/TARACORP SUPERFUND SITE PDFI
GRANITE CITY, ILLINOIS
U.S. ARMY CORPS OF ENGINEERS

MAIN INDUSTRIAL PROPERTY
SITE PLAN

Date: 9/10/92	Project Number 89MC114V	Figure Number: 4
Drawn by: kdw	Design by: dlp	Checked by: [illegible]

Woodward-Clyde Consultants

Engineering & sciences applied to the earth & its environment

SITE SAFETY AND HEALTH PLAN
ADDENDUM No. 1

NL/TARACORP
SUPERFUND SITE
GRANITE CITY, ILLINOIS

Prepared for
U.S. Department of the Army
Corps of Engineers, Omaha Division

WOODWARD-CLYDE CONSULTANTS

2318 Millpark
St. Louis, Missouri 63043

WCC Project no. 89MC114V

APPROVALS

Project Name: NL/Taracorp Superfund Site

Project Number: 89MC114V

Project Manager: Ken Hagg

Date of Issue: 15 April 1992

Effective Dates: 15 April 1992 through 15 April 1993

APPROVALS:

K G Hagg — 4/16/92

Project Manager (PM) — Date

David L. Pate — 4-15-92

Field Operations Manager (FOM) — Date

Cynthia Paulsen — 4-15-92

Site Safety Officer (SSO) — Date

N. Hunter — 4-15-92

Health and Safety Officer (HSO) — Date

4/16/92

Corporate Health and Safety Officer (CHSO) (CIH) — Date

SITE SAFETY AND HEALTH PLAN

ADDENDUM No. 1

1.0 INTRODUCTION

Due to changes in field activities, this Addendum No. 1 to the Site Safety and Health Plan (SSHP) dated 10/24/91 further establishes guidelines and requirements for the safety of personnel during the field activities associated with the pre-design field investigation for the NL Industries/Taracorp Superfund Site. This Addendum to the SSHP should be attached to all copies of the SSHP and distributed to all personnel on-site. This Addendum pertains to two field activities:

- Hand Auger Borings and Sampling
- Installation of Intervisible Permanent Horizontal Control Monuments (addition to SSHP)

Hand Auger Boring (HAB) soil samples are being collected from the "adjacent" residential areas and from the remote fill locations within the NL/Taracorp Superfund Site. To reduce heat stress among the HAB team members, this addendum recommends the team member documenting the field activities be required only to wear personal protective equipment (PPE) at EPA Level "D". This addendum changes the SSHP requirement on p. 27 that all Hand Auger Boring personnel are required to wear PPE at EPA Modified Level "D".

This addendum will allow one team member, besides conducting documentation, to also be a support person for the other team members within the exclusion and reduction zones. The team member conducting documentation will not be allowed within the exclusion and reduction zones. For explanation of work zones see Section 8.4 of the SSHP (pp. 19-20).

Tasks the team member wearing EPA Level "D" may conduct are:

- Resident contact during field activities
- Documentation of all field activities
- Handling and labeling of decontaminated sample jars
- Handling decontaminated equipment

The EPA Level "D" Personal Protective Equipment requirements are listed in Section 8.6.1 of the SSHP (p. 20).

3.0
INSTALLATION OF PERMANENT INTERVISIBLE MONUMENTS

Intervisible permanent horizontal control monuments were installed at the Main Industrial Property within the NL/Taracorp Superfund Site. This field activity was not included in the SSHP. The installation of the monuments includes digging four 1 ft by 2 ft holes with hand tools. This activity is considered to be a medium hazard. Direct contact by site personnel with hazardous substances is likely. Exposure could occur by contact with contaminated equipment or by the handling of the soil.

The installation of the monuments is an intrusive activity. All site safety of personnel should follow the guidelines and requirements listed in the SSHP for intrusive activities.
Personal Protective Equipment required for intrusive activities performed at the NL Site include EPA Modified Level "D" (p. 12, SSHP). All action guidelines for Modified Level "D" should also be followed as described in the SSHP (p. 27). Other site specific health and safety requirements such as decontamination should be followed as described in the SSHP.

FORM HS-507

SITE SAFETY PLAN ADDENDUM # 2

FIELD INVESTIGATION OF UNDERGROUND FUEL SPILLS

ADMINISTRATIVE INFORMATION

Project Number 89MC114V Project Name NL/TARACORP

Project Manager Ken Hagg Operating Unit St. Louis

Site Safety Officer Cynthia Pavelka Health & Safety Officer Greg Horton

Date of Issue 6/19/92 Effective Dates 6/19/92 to 6/19/93

SITE INFORMATION (attach map of site)

Location: Granite City, Illinois (See Project SSHP)

Pertinent History: The NL/Taracorp SSHP did not anticipate encountering petroleum products on site, so no provisions were included to cover this scenario.

Material(s) Spilled: Petroleum products were detected at the top of groundwater in well MW-108-92.

FIELD ACTIVITIES

Monitoring well installation and development.

Groundwater sampling

EMERGENCY TELEPHONE NUMBERS

Fire Department	See SSHP
Ambulance	(618)877-4747
Hospital	(618) 789-3000
Project Manager	(314) 429-0100
Health & Safety Officer	(216) 349-2708
Hospital	

507.0 PROCEDURES FOR FIELD INVESTIGATIONS OF UNDERGROUND SPILLS OF GASOLINE AND OTHER PETROLEUM DISTILLATE FUELS

507.1 PURPOSE

The purpose of this procedure is to establish sound and uniform health and safety procedures and guidelines for field operations associated with investigations of leakage of petroleum hydrocarbon fuels from underground storage tanks and pipes.

507.2 SCOPE

This procedure identifies the kinds of fuels and field activities to which it applies, assesses the hazards of fuels, and describes risk control measures.

507.3 APPLICABILITY

This procedure applies to (1) collection of samples of surface and subsurface soil, (2) construction, completion, and testing of groundwater monitoring wells, (3) collection of water samples from new and existing wells, and observing removal of underground fuel pipes and storage tanks at facilities that currently dispense or store (1) leaded gasoline (2) unleaded gasoline, (3) gasohol, (4) Numbers 1, 1D, 2, 2D, 4, 5, or 6 fueled oils, (5) Numbers 3, 4, or 5 jet fuel, and/or (6) used crankcase oil.

This procedure shall not be used for confined space entry (including entering trenches) or for installing or operating pilot and full-scale fuel recovery systems. It is also not applicable to

Petroleum distillate fuels exhibit relatively low acute inhalation and dermal toxicity. Concentrations of 160 to 270 ppm gasoline vapor have been reported to cause eye, nose, and throat irritation in people after several hours of exposure. Levels of 500 to 900 ppm have been reported to cause irritation and dizziness in one hour and 2,000 ppm has been reported to cause mild anesthesia in 30 minutes. Gasoline, kerosene, and some jet fuels will cause severe eye irritation on contact with the eye and low to moderate skin irritation on contact with the skin.

Ingestion of 10 to 15 grams (2 to 3 teaspoons) of gasoline has caused death in children. In adults, ingestion of 20 to 50 grams may produce severe symptoms of poisoning. Secondary pneumonia may occur if gasoline or other fuels are aspirated into the lungs.

Some gasoline additives, such as ethylene dichloride, ethylene dibromide, and tetraethyl- and tetramethyl-lead are highly toxic materials; however, their concentrations in gasoline are so low that their contribution to the overall toxicity of gasoline is negligible in most instances.

Petroleum distillate fuels are flammable. Under certain conditions, this property presents a greater risk than toxicity. Five of the 13 substances covered by this procedure are classified by the Federal Department of Transportation as flammable liquids as all five have flash points of 100 degrees F or less. These fuels are gasoline, gasohol, JP-1, JP-4, and No. 1 fuel oil. Lower explosive limits of the 12 fuels range from 0.6 to 1.4 percent (6,000 to 14,000 ppm).

3. Safety goggles or glasses. Must be worn when working within 10 feet of operating heavy equipment (e.g., drill rig, backhoe). Must be splash-proof when handling concentrated fuel product.

4. Nitrile or neoprene gloves. Must be worn when handling contaminated soil or water or drilling or digging into contaminated soil.

5. Neoprene or butyl rubber safety boots, calf-length. Must be worn when walking on obviously contaminated soil and when working within 10 feet of operating heavy equipment.

6. Hardhat. Must be worn when working within 10 feet of operating heavy equipment.

507.9 EXPLOSION HAZARD AND EVACUATION

When measurements with a combustible gas meter (CGM) indicate the presence of combustible gas levels equal to or exceeding the explosivity action level (see Section 507.10.2) in the work area, the following action must be taken.

1. Extinguish all possible ignition sources in the work area (e.g., shut down electrically and fuel powered motors).

2. Move personnel at least 100 feet away from work area.

3. Leave CGM in work area and return to work area only if CGM alarm goes off and remains off for at least 15 minutes.

4. Contact Health and Safety Officer (HSO).

507.10.3 MONITORING GUIDELINES

Vapor monitoring should be performed as often as necessary and wherever necessary to protect field personnel from hazardous vapors. Monitoring must be performed by individuals trained in the use and care of the required instruments. Because toxicity action levels are considerably lower then explosivity action levels, monitoring efforts should focus initially on detection of toxic vapors. The presence of explosive levels of gases and vapors should be performed only when gas/vapor concentrations exceed the ppm range of the monitoring instruments and when explosive levels are expected (e.g., inside tanks and other enclosed spaces).

During drilling operations, vapor emissions may be measured continuously or periodically. If vapors are measured continuously and the instrument must be unattended, the sample intake orifice or, in the case of instruments that operate by diffusion, the detector, must be positioned in a safe place downwind of the borehole and the instrument alarm set to sound at the action level.

If the alarm sounds while monitoring continuously for toxic concentrations, the sample intake orifice/detector should be moved so that vapor concentrations in the breathing zones of individuals closest to the boring are measured. Decisions regarding respirator use should be based on breathing zone vapor concentrations. If the alarm sounds while continuously monitoring fire explosive concentrations, initiate shut-down and evacuation procedures immediately. If vapor emissions are measured periodically, they should be measured whenever the boring is open. Measurements may be limited to breathing zone air.

the site safety officer, and are informed of the potential dangers that could be encountered in the areas.

507.12 DECONTAMINATION

Field decontamination of personnel and equipment is not required except when contamination is obvious (visually or by odor). Recommended decontamination procedures follow.

507.12.1 PERSONNEL

Gasoline, kerosene, jet fuel, and gasohol should be removed from skin using a mild detergent and water. Hot water is more effective than cold. Liquid dishwashing detergent is more effective than hand soap.

507.12.2 EQUIPMENT

Gloves, respirators, hardhats, boots and goggles should be cleaned as described under personnel; however, if boots do not become clean after washing with detergent and water, wash them with a strong solution of trisodium phosphate and hot water.

Sampling equipment, augers, vehicle undercarriages, and tires should be steam cleaned. The steam cleaner is a convenient source of hot water for personnel and protective equipment cleaning.

507.13 SMOKING

Smoking and open flames are strictly prohibited at sites under investigation.

hnu

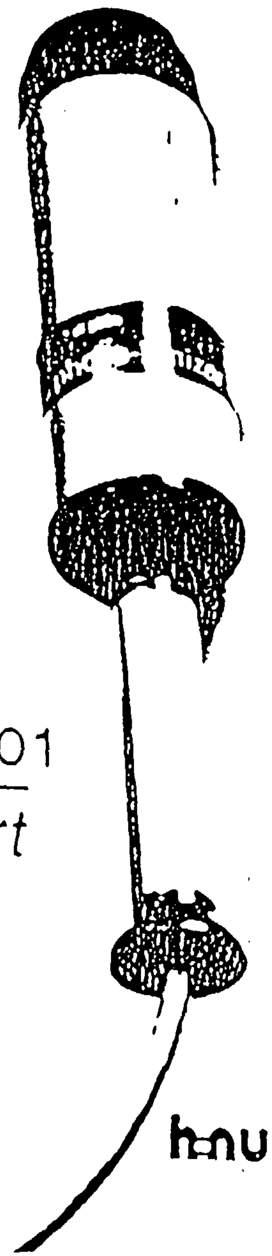
HNU Systems, Inc., 160 Charlemont Street, Newton, MA 02161-9987
Tel:(617)964-6690 Telex:6817153 Fax:(617)965-5812

HNU Systems (Canada), Ltd., 85 Albert Street, Suite 1610, Ottawa, Ontario K1P 6A4
Tel:(613)563-3674 Telex:053-3198 Fax:(613)563-1992

HNU Systems, Ltd., The Arsenal, Heapy Street, Macclesfield, Cheshire SK11 7JB
Tel:0625 615642 Telex:668005 Fax:0625 616916

Model ISPI-101

Quick-Start Manual



ARRANGEMENT OF FIELD USE CALIBRATION TEST SET-UP

Attach the probe to the readout module. Align the slot on the 12-pin connector (2) at the end of the probe cable with the tab in the 12-pin receptacle (1) on the readout module. DO NOT FORCE THE CONNECTOR INTO THE RECEPTACLE. Once the connector has been inserted into the receptacle, turn the connector clockwise until a distinct click is heard and felt.

Turn the function switch (3) to the BATT position. The meter needle should deflect to the green area at the righthand side of the meter scale plate. Listen to the probe and make sure that the fan is operating. It makes a humming sound. Look BRIEFLY directly into the probe inlet (13) and observe the lamp glow. The lamp glow will appear as a purple light.

> CAUTION: Prolonged exposure to the ultraviolet rays of the lamp will cause eye damage.

The lamp glow cannot be observed when the probe extension (14) is attached.

Turn the function switch (3) to the STANDBY position. The fan will continue to operate. The lamp will be off. The meter needle will move to the left out of the green area on the meter scale plate. Turn the zero knob (4) until the meter needle rests at 0. (The ISPI-101 can be electronically zeroed only while the function switch is in the STANDBY position.)

Check the span setting (1.0 for 9.5 eV lamps, 9.8 for 10.2 eV lamps, 5.0 for 11.7 eV lamps) and adjust as necessary using the span control (5). Connect the regulator to the calibration gas canister (see figure 2). Using flexible tubing (three inches long is sufficient, one quarter inch diameter), connect the calibration gas to the probe inlet (13, Figure 1) and open the valve on the regulator. Use of the probe extension (14, Figure 1) is optional during this procedure.[1] Recheck the electronic zero and adjust as necessary.

Once the ISPI-101 has been electronically zeroed, turn the function switch (3, Figure 1) to the 0-2000 range position (X100).

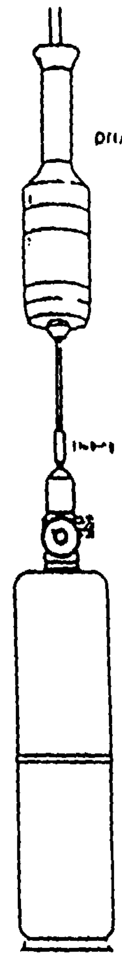


Figure 2

CALIBRATION

HNU calibration gas consists of approximately 100 ppm isobutylene in an air matrix. It has been referenced to benzene. The meter reading that should be obtained during calibration is marked on the gas canister label.[3] With the function switch (3, Figure 1) at the 0-2000 range position, the meter needle should move slightly to the right.

> NOTE: Any calibration gas used must have the same matrix gas as the atmosphere in which the ISPI-101 will be used. Use of any other gas will significantly affect the readings obtained. Readings may appear to be far higher or lower than they actually are. If the monitor is to be used in air, never use N_2 or any gas other than air, as the matrix gas in calibration standards.

Turn the function switch to the 0-200 range position (X100). The meter should read very close to the ppm number on the calibration gas canister. Adjust the span pot (5, Figure 1) until an exact reading is obtained. The span setting used to obtain an accurate reading in this procedure is the reference point from which all other readings will be determined.

Turn the function switch (3, Figure 1) to the 0-20 range position (X1). The meter needle should deflect fully to the right.

Turn the function switch back to the 0-200 range position and recheck the meter reading to ensure that an accurate reading has held. Make any needed adjustments to the span control (5, Figure 1), and, if necessary, recheck the accuracy by turning the function switch to the 0-20 range position and then back to the 0-200 range position.

Turn the function switch to the OFF position. Close the valve on the calibration gas regulator and disconnect it from the probe inlet (13, Figure 1). The ISPI-101 is now ready for field use.

> NOTE: High humidity (90 percent and above) will affect sensitivity. This should be taken into account when calibrating. Readings may appear to be lower than actual, but use of a humid air matrix in the calibration standard minimizes this effect.

QUICK CHECKS

Low Sensitivity: See Service Note 86-01, "Lamp and Ion Chamber Cleaning" on page 7 of this booklet.

- Meter reading below the green area and/or
- The low battery indicator LED is on; and/or
- The ISPI-101 is inoperable (will not function at all when the function switch (3, Figure 1) is in the BATT position:

The ISPI-101 requires a charge (see directions below).

The ISPI-101 has been designed with a battery protection circuit. When the output voltage of the battery has reached 11 volts DC, the ISPI-101 shuts itself down. This is not a malfunction, but simply an indication that the unit needs to be charged.

CHARGING THE ISPI-101

NOTE: NEVER CHARGE THE ISPI-101 IN A HAZARDOUS AREA!

Turn the function switch (3, Figure 1) to the OFF position. The probe may or may not be attached to the readout module during the ISPI-101 charging process; either way will cause no damage to the probe or the readout module, nor impair the charging process.

Connect the miniplug (9, Figure 1) on the charger to the minijack on the charger adapter (10, Figure 1). Plug the charger adapter plug (10, Figure 1) into the charger jack (8, Figure 1) on the side of the ISPI-101. This jack is recognized by the red ring around it. It is located on the black outer casing of the ISPI-101 readout module above the control section. Connect the charger power cord (11, Figure 1) to an AC power supply. Observe the LED on the charger (12, Figure 1). It should be on when the power cord is connected to an AC power supply. Charge the ISPI-101 for eight to ten hours or more.

The ISPI-101 can be left on charge whenever it is not in use. It cannot overcharge. The ISPI-101 cannot be operated when attached to the charger. If any contaminant (such as metal shavings) enters the charger jack (8, Figure 1) and causes a short, the ISPI-101 will not operate.

QUICK CHECKS

Charge did not "take":

- Is the ISPI-101 function switch in the OFF position?
- Is the battery check meter reading below the green arc on the meter face plate when the probe is not attached?
- Is the charger LED on?
- Is the AC power supply operational?
- Is the charger adapter plug (10, Figure 1) in the charging jack (8, Figure 1), or has any contaminant shorted the jack?
- Is the charger output -15 VDC?

To check the output of the charger, use a voltmeter. Disconnect the charger from the charger adapter. The charger must be connected to an AC power supply during this process. Place the black (common) lead on the miniplug on the sleeve. Place the red (positive) lead on the tip of the miniplug. Observe the voltage reading on the voltmeter (it will be a negative voltage reading). Repeat this process with the charger adapter attached to the charger miniplug and observe the voltage reading to ensure that the charger adapter is not faulty. Place the common lead on the charger adapter plug sleeve. Place the positive lead on the tip. The voltage reading should be the same as the reading taken directly from the charger minijack. The correct voltage is -15 VDC, ±1.5 VDC. If a positive voltage is read at this point, check the position of the voltmeter leads.

For more detailed information on the ISPI-101, consult the complete ISPI-101 manual, or contact HNU Systems, Inc.

[1] The probe extension may become contaminated during normal use and must be cleaned periodically. Use the same procedure as for ion chamber cleaning, which is described in Service Note 86-01 (included in this booklet). If the probe extension is used during calibration, it should be free of any contaminants to ensure an accurate calibration.

[2] Most calibration gas canisters supplied by HNU Systems, Inc., have a label stating a particular ppm to be read with a span setting of 9.8. This is the recommended span setting for the 10.2 eV lamp ONLY, which is the most commonly used lamp. Be sure to use the span setting recommended for the particular lamp that is used during the calibration: 1.0 for 9.5 eV lamps, 9.8 for 10.2 eV lamps, and 5.0 for 11.7 eV lamps.

CLEANING PROCEDURE

FOR PI-101 (GP, PL AND IS)
LAMP AND ION CHAMBER

LAMP REMOVAL

Remove the probe from the unit. Hold the probe upright, cable down. Remove the two cross headed screws that hold the black end cap. Carefully remove the end cap. If the whole ion chamber block remains in the cap, remove it. The light source will remain in the probe body. For IS models only, remove the two screws holding the ion chamber on and lift the chamber off the probe. For PM and S models, place your hand over the top of the probe and tilt it. The lamp will fall into your hand. For IS models only, loosen the small set screw in the side of the lamp housing, place your hand over the top of the probe and tilt. The lamp will fall into your hand. Note the eV number etched on the lamp.

LAMP CLEANING 10.2 AND 9.5 eV

a. Put a small drop of HNU cleaning compound (part # [illegible]) on the lens of the lamp (the small glass circle on the metal end).
b. Using a nonlinting tissue, rub in a circular motion until all residue is removed.
c. Rinse with hot, clean tap water and dry with nonlinting tissue.
d. If the lens is still not clean, repeat steps a, b and c.

LAMP CLEANING 11.7 AND 8.3 eV

a. Clean the lens (only the small glass circle on the metal end) with freon or any chlorinated organic solvent to remove any deposits using a nonlinting tissue.
b. DO NOT use HNU cleaning compound or any water miscible solvent on these lamps.
c. If still dirty, repeat step a.

ION CHAMBER CLEANING

1. Remove the "O" ring from the side opposite the wire mesh and save.
2. Agitate the entire assembly in a beaker of methanol or acetone, or place the beaker and contents in an ultrasonic bath for ten minutes.
3. Remove the beaker and shake out surplus solvent. Dry overnight at room temperature or bake for two hours in a drying oven at 100 C. Do not dry at temperatures over 100 C. Allow chamber to cool completely before reinstalling.
4. In an emergency, careful use of a hairdryer is permissible.

REASSEMBLY

1. Hold the probe upright, cable down, and replace the lamp with the lens uppermost. For IS models only, tighten the set screw in the lamp housing after insertion.
2. Replace the "O" ring in the groove in the ion chamber on the side opposite the wire mesh.
3. Place the ion chamber over the lamp with the wire mesh side uppermost. Make sure all the connection pins, screw holes, and the vent hole in the ion chamber are correctly aligned. (The small vent hole in the ion chamber lines up with the vent hole in the bottle which has a small black "O" ring around it.) For IS models only, secure the chamber with the two screws.
4. Replace the bottle cap noting the alignment of the screw holes. Replace the two screws and tighten evenly.

The unit is now ready to be used.

SERVICE NOTE #86-01

DOCUMENTATION FOR

SITE SAFETY BRIEFINGS

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE Nov. 1, 1991 TIME 8:30 am

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 87MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hugg

Manager Field Operations Dave Pate

TOPICS COVERED DURING BRIEFING:

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE

X HEALTH EFFECTS OF CHEMICAL HAZARDS

X PHYSICAL HAZARDS ON SITE

X LEVELS OF PROTECTION REQUIRED

X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)

X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

X MONITORING PROCEDURES

X ACTION LEVELS

X DECONTAMINATION PROCEDURES

X LOCATION OF EMERGENCY NUMBERS

X ROUTE TO THE HOSPITAL

Hand Auger Boring Teams

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Ray Scherrer (signature) Ray W. Scherrer		CFF	CFF	CFF
2. (print) Wendy Reinbolt (signature) Wendy E Reinbolt		CFF	CFF	CFF
3. (print) Mark Wallace (signature) Mark Wallace		CFF	CFF	CFF

22362 (C:\JUNE\22362.FRM 06-13-90) (JEM)

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 1/5/91 TIME 1:00 pm.

SITE LOCATION NL/Taracorp Superfund PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg
FOL - Dave Pate

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
__ HEALTH EFFECTS OF CHEMICAL HAZARDS
__ PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIRE FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND ~~READ~~ CFP

__ MONITORING PROCEDURES
__ ACTION LEVELS
__ DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL

Excluded from Exclusion and Decon Area. Only [illegible] can be
in support zone. ~~Will be taking split samples~~ CFP In charge of
split samples for Granite City Citizen Action Group.

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Craig Tarpoff (signature) Craig A Tarpoff		Nc CFP	Nc CFP	— CFP
2. (print) (signature)				
3. (print) (signature)				

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
4. (print) Kim Ilenda (signature) Kim Ilenda		CFP	CFP	CFP
5. (print) Eric Page (signature) Eric A. Page		CFP	CFP	CFP
6. (print) David Pate (signature) David L. Pate		CFP	CFP	CFP
7. (print) Gregg Hagerty (signature) Gregg Hagerty		CFP	CFP	CFP
8. (print) [illegible] (signature) [illegible]		CFP	CFP	CFP
9. (print) (signature)				
10. (print) (signature)				
11. (print) (signature)				
12. (print) (signature)				

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 11/15/91 TIME 10:00am

SITE LOCATION NL/Taracorp PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg
FOM - Dave Pate

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X MONITORING PROCEDURES
X ACTION LEVELS
X DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIRE FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

Layne-Western Employees - Drill Rig

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) ~~Sonny~~ Willis Durham (Sonny) (signature) Willis [illegible]		3/15/91 CFP	3/15/91 CFP	1/25/91 CFP
2. (print) Steve Cantrell (signature) [illegible]		3/15/91 CFP	3/15/91 CFP	10/1/91 CFP
3. (print) Deno Zucca (signature) [illegible]		6/30/91 CFP	½ face need card CFP	Agent will get documentation

Bring in Monday

22362 (C:\JUNE\22362 FRM 06-13-90) (JEM)

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 11/13/91 TIME 10:00am.

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ
X MONITORING PROCEDURES
X ACTION LEVELS
X DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL

WCC Employee - Drill Rig

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Jorge Garcia (signature) Jorge Garcia		CFP yes	Y CFP	Y CFP
2. (print) (signature)				
3. (print) (signature)				

22362 (C:\JUNE\22362.FRM 06-13-90) (JEM)

SAFETY COMPLIANCE AGREEMENT AND DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 11/19/91 TIME 10:00 am

SITE LOCATION VL/Tavacorp PROJECT NUMBER 89MC114V - Ø

SITE SAFETY OFFICER C[illegible]thia Pavelka PROJECT MANAGER Ken Hagg

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE

X HEALTH EFFECTS OF CHEMICAL HAZARDS

X PHYSICAL HAZARDS ON SITE

__ LEVELS OF PROTECTION REQUIRED

X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT ...)

X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

__ MONITORING PROCEDURES

__ ACTION LEVELS

__ DECONTAMINATION PROCEDURES

X LOCATION OF EMERGENCY NUMBERS

X ROUTE TO THE HOSPITAL

[illegible] Inspection Survey Teams

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Jeffrey Miller, CIH, Sr. Consultant (signature)		NA CFP	NA 11/19/91	NA
2. (print) Carl Ender, CIH, Sr. Consultant (signature) Carl W Ender		NA CFP	NA 11/19/91	NA
3. (print) [illegible] Hubert Assoc. Consultant (signature) Josie Hubert		NA CFP	NA 11/19/91	NA

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
4. (print) Sharon Weiss (signature) Sharon Weiss		NA CFP	NA 11/19	NA /91
5. (print) (signature)				
6. (print) (signature)				
7. (print) (signature)				
8. (print) (signature)				
9. (print) (signature)				
10. (print) (signature)				
11. (print) (signature)				
12. (print) (signature)				

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 11/21/91 TIME 7:30am

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg

FO~~X~~[CFP] M - Field Operations - Dave Pat

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X MONITORING PROCEDURES
X ACTION LEVELS
X DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

Field ~~Proposed~~ CFP Activities - Installing Monuments and Surveying

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Lou Zambrana (signature) [signature]		~~8-23-91 CFP~~ Exp 8/23/92 CFP	8-22-91 CFP ½ mask	12-6-91 CFP
2. (print) Michael D. Robertson (signature) [signature]		8/23/92 CFP	½ mask 8-22-91 CFP	3-13-90 CFP (Full Physical)
3. (print) John Heatherington (signature) [signature]	Taking Course	Nov. 25 - CFP	NA	Has Not had Medical Yet CFP

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 11/21/91 TIME 3:00 pm.

SITE LOCATION NL Maracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg
FOM - Dave Pat

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

X MONITORING PROCEDURES
X ACTION LEVELS
X DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL

Field Activities - Installing Monuments and Surveying

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Mike Zambrana (signature) [signature]		8-23-92 Expires CFP	8-~~21~~ 22-91 CFP ½ mask	11-25-91 CFP
2. (print) (signature)				
3 (print) (signature)				

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 4/21/92 TIME 7:30 am

SITE LOCATION NL Taracorp PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER KAH

TOPICS COVERED DURING BRIEFING

X Addendum No. 1 to SSHP

__ EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE

__ HEALTH EFFECTS OF CHEMICAL HAZARDS

__ PHYSICAL HAZARDS ON SITE

__ LEVELS OF PROTECTION REQUIRED

__ LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)

__ VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

__ MONITORING PROCEDURES

__ ACTION LEVELS

__ DECONTAMINATION PROCEDURES

__ LOCATION OF EMERGENCY NUMBERS

__ ROUTE TO THE HOSPITAL

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1 (print) Cynthia Pavelka (signature) Cynthia Pavelka	WCC	Y CFP	Y CFP	Y CFP
2 (print) Mark Wallace (signature) Mark Wallace	WCC	Y CFP	Y CFP	Y CFP
3 (print) Kim Ilenda (signature) Kim Ilenda	WCC	Y CFP	Y CFP	Y CFP

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
4. (print) Eric Page (signature) [signature]	WCC	Y CFP	Y CFP	Y CFP
5. (print) (signature)				
6. (print) (signature)				
7. (print) (signature)				
8. (print) (signature)				
9. (print) (signature)				
10. (print) (signature)				
11. (print) (signature)				
12. (print) (signature)				

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 5/5/92 TIME 8:15

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
__ LEVELS OF PROTECTION REQUIRED
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIRE FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ

__ MONITORING PROCEDURES
__ ACTION LEVELS
__ DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL

Home Inspection Crew.

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Bob McKinley (signature) Bob McKinley		NA 5/	NA 5/92	NA CFP
2. (print) (signature)				
3. (print) (signature)				

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 6/8/92 TIME 12:45 pm.

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER C. Pavelka PROJECT MANAGER Ken Hagg
FOM - Dave Pate

TOPICS COVERED DURING BRIEFING

X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
X HEALTH EFFECTS OF CHEMICAL HAZARDS
X PHYSICAL HAZARDS ON SITE
X LEVELS OF PROTECTION REQUIRED
X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)
X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ
X MONITORING PROCEDURES
X ACTION LEVELS
X DECONTAMINATION PROCEDURES
X LOCATION OF EMERGENCY NUMBERS
X ROUTE TO THE HOSPITAL

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Dero Zuccu (signature) C. Zuccn	8-hr Refresher 6/6/92 Does not have documentation yet.	6/30/91 6/8/92	3/14/91	11/27/91
2. (print) Willis Durham (signature) Willis Durham		3/26/92 8-hr Ref. 6/9/92	3/26/92	3/20/92
3. (print) Chris Mazdra (signature) Chris Mazdra		3/23/92 8-hr Refresh 6/8/92	3/23/92	2/25/92

SAFETY COMPLIANCE AGREEMENT AND DOCUMENTATION OF SITE SAFETY BRIEFING

DATE 6/11/92 TIME 7:45 am

SITE LOCATION NL/Taracorp Superfund Site PROJECT NUMBER 89MC114V

SITE SAFETY OFFICER Cynthia Pavelka PROJECT MANAGER Ken Hagg

TOPICS COVERED DURING BRIEFING:

- X EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
- X HEALTH EFFECTS OF CHEMICAL HAZARDS
- X PHYSICAL HAZARDS ON SITE
- X LEVELS OF PROTECTION REQUIRED
- X LOCATION OF EMERGENCY EQUIPMENT (FIRST AID KIT, FIR FIGHTING EQUIPMENT . . .)
- X VERIFICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ
- X MONITORING PROCEDURES
- X ACTION LEVELS
- X DECONTAMINATION PROCEDURES
- X LOCATION OF EMERGENCY NUMBERS
- X ROUTE TO THE HOSPITAL

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTATION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1. (print) Gary Carpenter	(Layne-Western Drilling)	3/5/88 Ref. 3/92	3/15/91	9/2/91
(signature) Gary Carpenter		CFP	6/11/92	
2. (print)				
(signature)				
3. (print)				
(signature)				

22362 (C:\UUNE\22362.FRM 06-13-90) (JEM)

PERSONAL AIR MONITORING

CALCULATIONS

Woodward-Clyde Consultants

Sheet No 1 Of 1

File

Made by C F P Date 11/7/91

Checked by FDM Date [illegible]

FOR Action Level Calculations for Hand Auger Boring Teams

PASP Samples Collected during 11/4/91 thru 11/5/91.

Pump No.	Analytical Results (mg/filter)	Sample Collection Period (min)	Flowrate (cc/min)	Reporting Limit (RL) (mg/m^3)	Exposure Level (mg/m^3)
PASP #1	0.000061 (<IDLH)	490	1500	0.0002 ✓	<RL (0.00008) ✓
PASP #2	0.000158	515	1500	0.0002 ✓	0.0002 ✓
PASP #3	0.000151	545	1500	0.0002 ✓	<RL (0.00019) ✓
PASP #4	0.000150	545	1500	0.0002 ✓	<RL (0.00018) ✓
PASP #5 (Blank)					

Laboratory Detection Limit for ICP Instrument Method 6010 0.00013 mg/filter

Reporting Limit Calculation

z = (Flowrate x Sample Time) ($m^3/10^6cc$)

x = (Reporting Limit mg/filter) / z

[illegible] z = (1500 cc/min x 490 min)($m^3/10^6cc$) = 0.735 m^3 ✓

x = 0.00013 mg/filter / 0.735 m^3 filter = 0.00018 mg/m^3 ✓

Exposure Level Calculation

z = Sample Air Volume = [Flowrate (cc/min) / $10^6 cc/m^3$][Sample Time (min)]

y = Exposure Level = [Analytical Result (mg/filter)] / z

z = (1500 cc/min)(490 min)/($10^6 cc/m^3$) = 0.735 m^3

y = (0.000061 mg/filter)/(0.735 m^3) = 0.000083 mg/m^3 ✓

[illegible] = [illegible] mg/m^3

[illegible] PEL => ALL EXPOSURES ARE LESS THAN PEL

∴ OK

Woodward-Clyde Consultants

Sheet No. 1 of 1

File ____

Made by CFP Date 11/21/91

Checked by ____ Date ____

FOR Action Level Calculations for Drilling Rig Crew

PASP Samples Collected during 11/15/91 and 11/18/91.

Sample No.	Analytical Result (mg/filter)	Sample Collection Period (min)	Flowrate (cc/min)	Reporting Limit (RL) (mg/m³)	Exposure Level (mg/m³)
PASP#6	0.000223	480	2000	0.00014	0.000232
PASP#7	0.000213	480	2000	0.00014	0.000222
PASP#8	<0.00013	660	1500	0.00013	< Rep. Lim. (0.00013)
PASP#9	0.000775	660	1500	0.00013	0.000783
PASP#10	<0.00013	Blank		0.00013	< Rep. Lim. (0.00013)

Instrument Detection Limit < 0.00013 mg/filter

Reporting Limit Calculation

z = (Flowrate x Sample Time) (m³ / 10⁶ cc)

x = [Lab. Reporting Limit (mg/filter)] / z

PASP#6 z = (2000 cc/min)(480 min) m³/10⁶ cc = 0.960 m³

x = 0.00013 mg/filter / 0.96 m³/filter = 0.00014 mg/m³

Exposure Limit Calculation -

z - Sample Air Volume = [Flowrate (cc/min) / 10⁶ cc/m³][Sample Time (min)]

y = Exposure Level = [Analytical Results (mg/filter)] / z

PASP#6 z = (2000 cc/min)(480 min) / 10⁶ cc/m³ = 0.960 m³

y = (0.000223 mg/filter) / 0.960 m³ = 0.000232 mg/m³

PEL (Permissible Exposure Limit) For Lead = 0.05 mg/m³

Compare Exposure Levels to PEL ⇒ All Exposures are less than PEL

Woodward-Clyde Consultants

Sheet No 1 Of 2

File ______

Made by [illegible] Date 11/[illegible]

Checked by CFP Date 12/2/91

FOR Lead Action levels for Drilling Rig Crew

PASP Samples collected on 11/22/91

Sample No.	Analytical results (mg/filter)	Sample Collection Period (min)	Flowrate (cc/min)	Reporting Limit (mg/m³)	Exposure Level (mg/m³)
PASP #11	0.0006	390	2000	CFP sig. dig. 0.00017 0.000167	CFP sig. dig. 0.00077 ~~0.000769~~
PASP #12	0.002	390	2000	CFP sig. dig. 0.00017 0.000167	CFP sig. dig. ~~0.002564~~ 0.0026

Instrument Detection Limit <0.00013 mg/filter

Reporting Limit =

Ξ = (flow rate × sample time)(m³/10⁶ cc)

x = [Lab reporting limit (mg/filter)] / Ξ

PASP #1

Ξ = 2000 cc/min (390 min)(m³/10⁶ cc) = 0.780 m³

x = 0.00013 mg/filter / 0.780 m³ = 0.000167 mg/m³

CFP significant digits should be 5

0.00017 mg/m³

Exposure Level =

y = Exposure level = [Analytical results (mg/filter)] / Ξ

PASP #1

Ξ = 0.780 m³

y = 0.0006 mg/filter / 0.780 m³ = 0.000769 mg/m³

CFP sig. dig. 0.0008

PASP #2

Ξ = 0.780 m³

y = 0.002 mg/filter / 0.780 m³ = 0.002564 mg/m³

CFP sig. digits 0.003

Woodward-Clyde Consultants

File ______

Made by BMM Date ______
Checked by CFP Date 12/2/91

FOR Lead Action levels for Drilling Rig Crew

PEL (Permissible Exposure Limits) for Lead = 0.05 mg/m

Compare Exposure levels to PEL => All exposure levels are less than PEL

PERSONAL AIR MONITORING

ANALYTICAL RESULTS

REPORT
OF
ANALYTICAL RESULTS

Project No.:
5912031 0100

Prepared For:
Woodward-Clyde Consultants
Maryland Heights, MO 63043

Submitted By:
St. Louis Chemistry Laboratory
Environmental Science &
Engineering, Inc.

December 10, 1991

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December 10, 1991
ESE No. 5912031 0100

Ms. Cynthia Pavelka
Woodward-Clyde Consultants
2318 Millpark Dr.
Maryland Heights, MO 63043

RE: **Report of Analytical Chemistry Results,**
NL/Tara Corp Superfund Site
Industrial Hygiene Samples (24 Hour Service)

Dear Ms. Pavelka:

Enclosed is the complete report of results for twelve (12) PASP filter samples received in the ESE St. Louis Laboratory on November 5, 6, 18 and 22, 1991. The preliminary results have been reported to you verbally on November 7 and 19, 1991 and via telecommunications on November 26, 1991. The samples were analyzed in accordance with the approved NIOSH methods as indicated in the report. Sample results are reported in mg/m^3 based upon volumes issued by you to the ESE Laboratory. Blanks and samples issued without volumes are reported in mg-total.

The QC results are composed of the following summaries: Method Blank for method background evaluation, Continuing Calibration Verification for instrument stability check and Standard Matrix Spike Recovery for method performance evaluation.

The QC results have been reviewed by the analysts and the Laboratory Manager. The QC results indicate that there were no technical problems with the analysis.

We appreciate the opportunity to be of technical service to you. If there are any questions with regard to this report, please feel free to call.

Sincerely,

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

John F. Gemoules

John F. Gemoules
Laboratory Project Manager

JFG/pl/REPORT/WWC-F.RP1

Enclosures

11665 Lilburn Park Road St. Louis, MO 63146-3535 Phone (314) 567-4600 Fax (314) 567-5030

Environmental Science & Engineering, Inc.

St. Louis Chemistry Laboratory

11665 Lilburn Park Road
St. Louis, Missouri 63146-3535

Phone (314) 567-4600
Fax (314) 567-5030

Analytical Chemistry Results

STATUS: FINAL

PROJECT NAME: WOODWARD CLYDE/NL-TARA CORP./FILTERS

PROJECT NUMBER: 5912031 0100

REPORT DATE: 11-27-91

SAMPLE MATRIX: FILTERS

LAB MANAGER/QC REVIEW: JEFFERY W. SIRIA

PROJECT MANAGER: JOHN F. GEMOULES

REPORT APPROVED BY: FRANCIS Y. HUANG

SAMPLE I.D.	LABORATORY I.D.	COLLECTION DATE	RECEIVED DATE	LEAD, MG/M3(AIR) METHOD: NIOSH 7300	ANALYSIS DATE	CHEM. INIT.
PASP#1	WWC-F*1	11/05/91	11/05/91	<0.0002	11-06-91	JWC
PASP#2	WWC-F*2	11/05/91	11/05/91	0.0002	11-06-91	JWC
PASP#3	WWC-F*3	11/05/91	11/05/91	0.0002	11-06-91	JWC
PASP#4	WWC-F*4	11/05/91	11/05/91	0.0002	11-06-91	JWC

SAMPLE I.D.	LABORATORY I.D.	COLLECTION DATE	RECEIVED DATE	LEAD, MG-TOTAL METHOD: NIOSH 7300	ANALYSIS DATE	CHEM. INIT.
PASP#5	WWC-F*5	11/06/91	11/06/91	<0.0001	11-20-91	JWC
PASP#6	WWC-F*6	11/15/91	11/18/91	0.0002	11-20-91	JWC
PASP#7	WWC-F*7	11/15/91	11/18/91	0.0002	11-20-91	JWC
PASP#8	WWC-F*8	11/15/91	11/18/91	<0.0001	11-20-91	JWC
PASP#9	WWC-F*9	11/15/91	11/18/91	0.0008	11-20-91	JWC
PASP#10	WWC-F*10	11/15/91	11/18/91	<0.0001	11-20-91	JWC
PASP#11	WWC-F*11	11/22/91	11/22/91	0.0006	11-26-91	JWC
PASP#12	WWC-F*12	11/22/91	11/22/91	0.002	11-26-91	JWC

SECTION 2

QC Summary

Method Blank Sample Summary

NAME	UNITS	STOR*METH	BATCH	SAMPLE	DATE	FOUND	FOOTNOTE
BARIUM	MG-TOTAL	1007*SIHA	S6452	MB*NOFILTER*2	11/06/91	0.00001	
BARIUM	MG-TOTAL			MB*FILTER*2		0.00001	
BARIUM	MG-TOTAL			MB*NOFILTER*3		0.000006	
BARIUM	MG-TOTAL			MB*FILTER*3		0.00002	
BARIUM	MG-TOTAL			MB*NOFILTER*4		0.000002	
BARIUM	MG-TOTAL			MB*FILTER*4		0.00005	
BARIUM	MG-TOTAL			MB*NOFILTER*5		0.00005	
BARIUM	MG-TOTAL			MB*FILTER*5		0.00004	
BARIUM	MG-TOTAL		S6453	MB*NOFILTER*1	11/20/91	0.00002	
BARIUM	MG-TOTAL			MB*FILTER*1		0.00002	
BARIUM	MG-TOTAL			MB*NOFILTER*2		0.00001	
BARIUM	MG-TOTAL			MB*FILTER*2		0.000008	
BARIUM	MG-TOTAL			MB*NOFILTER*3		0.000009	
BARIUM	MG-TOTAL			MB*FILTER*3		0.00002	
LEAD	MG-TOTAL	1051*SIHA	S6452	MB*NOFILTER*2	11/06/91	0.0001	
LEAD	MG-TOTAL			MB*FILTER*2		0.00008	
LEAD	MG-TOTAL			MB*NOFILTER*3		0.00007	
LEAD	MG-TOTAL			MB*FILTER*3		0.00009	
LEAD	MG-TOTAL			MB*NOFILTER*4		0.0001	
LEAD	MG-TOTAL			MB*FILTER*4		0.00004	
LEAD	MG-TOTAL			MB*NOFILTER*5		0.00009	
LEAD	MG-TOTAL			MB*FILTER*5		0.0002	
LEAD	MG-TOTAL		S6453	MB*NOFILTER*1	11/20/91	0.00002	
LEAD	MG-TOTAL			MB*FILTER*1		0.0	
LEAD	MG-TOTAL			MB*NOFILTER*2		0.00003	
LEAD	MG-TOTAL			MB*FILTER*2		0.0	
LEAD	MG-TOTAL			MB*NOFILTER*3		0.0	
LEAD	MG-TOTAL			MB*FILTER*3		0.0	

Continuing Calibration Verification Sample Summary

NAME	UNITS	STOR*METH	BATCH	SAMPLE	DATE	TARGET	FOUND	%RECV	RECV CRIT	FOOTNOTE
BARIUM	MG-TOTAL	1007*SIHA	S6452	CCV*CHECK*1	11/06/91	2.00	2.02	101	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*2		2.00	2.04	102	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*4		2.00	1.99	99.5	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*5		2.00	2.00	100.0	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*6		2.00	2.01	101	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*7		2.00	1.97	98.5	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*8		2.00	2.01	101	80-120	
BARIUM	MG-TOTAL		S6453	CCV*CHECK*1	11/20/91	2.00	2.04	102	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*2		2.00	2.10	105	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*3		2.00	2.07	104	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*4		2.00	2.08	104	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*5		2.00	2.07	104	80-120	
BARIUM	MG-TOTAL			CCV*CHECK*6		2.00	2.04	102	80-120	
LEAD	MG-TOTAL	1051*SIHA	S6452	CCV*CHECK*1	11/06/91	2.00	2.06	103	80-120	
LEAD	MG-TOTAL			CCV*CHECK*2		2.00	2.08	104	80-120	
LEAD	MG-TOTAL			CCV*CHECK*4		2.00	2.06	103	80-120	
LEAD	MG-TOTAL			CCV*CHECK*5		2.00	2.06	103	80-120	
LEAD	MG-TOTAL			CCV*CHECK*6		2.00	2.07	104	80-120	
LEAD	MG-TOTAL			CCV*CHECK*7		2.00	2.04	102	80-120	
LEAD	MG-TOTAL			CCV*CHECK*8		2.00	2.06	103	80-120	

Continuing Calibration Verification Sample Summary

NAME	UNITS	STOR*METH	BATCH	SAMPLE	DATE	TARGET	FOUND	%RECV	RECV CRIT	FOOTNOTE
LEAD	MG-TOTAL		S6453	CCV*CHECK*1	11/20/91	2.00	2.05	103	80-120	
LEAD	MG-TOTAL			CCV*CHECK*2		2.00	2.13	107	80-120	
LEAD	MG-TOTAL			CCV*CHECK*3		2.00	2.09	105	80-120	
LEAD	MG-TOTAL			CCV*CHECK*4		2.00	2.07	104	80-120	
LEAD	MG-TOTAL			CCV*CHECK*5		2.00	2.07	104	80-120	
LEAD	MG-TOTAL			CCV*CHECK*6		2.00	2.04	102	80-120	

Standard Matrix Spike Recovery and Replicate Summary

NAME	UNITS	STOR*METH	BATCH	SAMPLE	DATE	TARGET	FOUND	%RECV	RECV CRIT	R.P.D.	R.P.D. CRIT.	FOOTNOTE
BARIUM	MG-TOTAL	1007*SIHA	S6452	SP1*NONE*2	11/06/91	0.300	0.294	98.0	N/A		20	
BARIUM	MG-TOTAL			SP2*NONE*2		0.300	0.262	87.3	N/A	11.5	20	
BARIUM	MG-TOTAL			SP1*NONE*3		0.300	0.291	97.0	N/A	RPD*1	20	
BARIUM	MG-TOTAL			SP2*NONE*3		0.300	0.300	100.0	N/A	3.05	20	
BARIUM	MG-TOTAL			SP1*NONE*4		0.300	0.281	93.7	N/A	RPD*1	20	
BARIUM	MG-TOTAL			SP2*NONE*4		0.300	0.286	95.3	N/A	1.69	20	
BARIUM	MG-TOTAL			SP1*NONE*5		0.300	0.300	100.0	N/A	RPD*1	20	
BARIUM	MG-TOTAL			SP2*NONE*5		0.300	0.291	97.0	N/A	3.05	20	
BARIUM	MG-TOTAL		S6453	SP1*NONE*1	11/20/91	3.00	2.72	90.7	N/A		20	
BARIUM	MG-TOTAL			SP2*NONE*1		0.030	0.023	76.7	N/A		20	
BARIUM	MG-TOTAL			SP1*NONE*2		0.300	0.258	86.0	N/A		20	
BARIUM	MG-TOTAL			SP2*NONE*2		0.300	0.290	96.7	N/A	11.7	20	
BARIUM	MG-TOTAL			SP1*NONE*3		0.030	0.027	90.0	N/A		20	
BARIUM	MG-TOTAL			SP2*NONE*3		0.030	0.028	93.3	N/A	3.60	20	
LEAD	MG-TOTAL	1051*SIHA	S6452	SP1*NONE*2	11/06/91	0.030	0.029	96.7	N/A		20	
LEAD	MG-TOTAL			SP2*NONE*2		0.030	0.029	96.7	N/A	0.0	20	
LEAD	MG-TOTAL			SP1*NONE*3		0.030	0.029	96.7	N/A	RPD*1	20	
LEAD	MG-TOTAL			SP2*NONE*3		0.030	0.030	100.0	N/A	3.36	20	
LEAD	MG-TOTAL			SP1*NONE*4		0.030	0.028	93.3	N/A	RPD*1	20	
LEAD	MG-TOTAL			SP2*NONE*4		0.030	0.028	93.3	N/A	0.0	20	
LEAD	MG-TOTAL			SP1*NONE*5		0.030	0.029	96.7	N/A	RPD*1	20	
LEAD	MG-TOTAL			SP2*NONE*5		0.030	0.029	96.7	N/A	0.0	20	
LEAD	MG-TOTAL		S6453	SP1*NONE*1	11/20/91	3.00	2.60	86.7	N/A		20	
LEAD	MG-TOTAL			SP2*NONE*1		0.030	0.021	70.0	N/A		20	
LEAD	MG-TOTAL			SP1*NONE*2		0.030	0.029	96.7	N/A	RPD*1	20	
LEAD	MG-TOTAL			SP2*NONE*2		0.030	0.029	96.7	N/A	0.0	20	
LEAD	MG-TOTAL			SP1*NONE*3		0.030	0.026	86.7	N/A	RPD*1	20	
LEAD	MG-TOTAL			SP2*NONE*3		0.030	0.027	90.0	N/A	3.74	20	

N/A- Not applicable. Recovery criteria has yet to be established for this method.

SECTION 3

Chain of Custody

Woodward-Clyde Consultants

Engineering & sciences applied to the earth & its environment

July 15, 1992

Mr. Eugene Liu
Corps of Engineers
215 North 17th St.
Omaha, Nebraska 68102-4978

Dear Mr. Liu:

As requested by Mrs. Terry Bucholz, enclosed is a summary report for the Home Inspection Survey (HIS) Recommendation Letters that were forwarded to Mr. Brad Bradley of the USEPA to sign and mail.

The summary lists residents and owners to whom letters were mailed, and is divided into Phases I and II. Phase I surveys were completed in November and December, 1991. The respective letters and recommendations were sent to Mr. Brad Bradley of the USEPA on June 30, 1992 to sign and mail. Phase II surveys were completed May, 1992. The respective letters and recommendations are being sent to Mr. Brad Bradley to sign and mail concurrent with this submittal.

The total number of letter packages to be mailed by the USEPA is as follows:

Phase I	
Residents	91
Property Owners	35
Phase II	
Residents	100
Property Owners	41
Total	267

The recommendation checklist included with each letter is based upon the inspection data collected by the HIS inspectors during their inspection visits. The main pieces of data obtained by the inspectors on which the recommendations are based included the number of children living in the home, the percentage of peeling paint in each room, and the occurrence of lead pipes and solder joints.

2318 Millpark Drive • Maryland Heights, Missouri 63043
314-429-0100 • Fax 314-429-0462

A complete copy of the appointment scheduling records, inspection forms, and letters to residents and owners with recommendations are part of the project files that will be forwarded to the Corps of Engineers at the conclusion of the project.

If you have any questions or would like more detailed information, please call.

Very truly yours,

Wendy Reinbolt

Wendy Reinbolt

5 Enclosures

cc: B. Bradley, USEPA
K. Hagg
D. Pate

PHASE I HOME INSPECTION SURVEY
RECOMMENDATION LETTERS SENT TO THE FOLLOWING PROPERTY OWNERS:

PROPERTY OWNER	PROPERTY SURVEYED
EDWARD MELTON 2509 W MORELAND DR GRANITE CITY, IL 62040	1938 ADAMS
PHILLIP JAIME 1643 SPRUCE GRANITE CITY, IL 62040	2157 BENTON 2159 BENTON
MYLES J MIDGLEY JR 600 AUDUBON PLACE CT BALLWIN, MO 63021	2163A BENTON 2163 BENTON
KHALDOUN SAFFAF 1728 CHESTNUT ST GRANITE CITY, IL 62040	1728 CHESTNUT 1730 CHESTNUT
SHELBY KESSEL 7516 SUFFILD ST LOVE PARK, IL 61103	2023 BRYAN
CHARLES STONE 3010 BUXTON GRANITE CITY, IL 62040	1708A CLEVELAND 1708B CLEVELAND 1708 CLEVELAND 1710A CLEVELAND 1710B CLEVELAND 1715 EDISON 1715A EDISON 1715B EDISON 1014R GREENWOOD 1014 GREENWOOD
BRADLEY ROSS 2055b CLEVELAND BLVD GRANITE CITY, IL 62040	2055A CLEVELAND

JOHN LARGE 2408 SUNBURY GRANITE CITY, IL 62040	1719A DELMAR 1719B DELMAR
CAROL COREY 4005 NORTH GRANITE CITY, IL 62040	807 NIEDRINGHAUS
DAVE MITCHELL 20TH AND EDISON GRANITE CITY, IL 62040	1245 NIEDRINGHAUS 1255 NIEDRINGHAUS
GARY MILLER 2207 ILLINOIS GRANITE CITY, IL 62040	1614 SPRUCE REAR 1614 SPRUCE FRONT
BRAD WALLACE 2039 STATE ST GRANITE CITY, IL 62040	2039A STATE 2039C STATE
WILLIAM A DALTON 2036B WASHINGTON GRANITE CITY, IL 62040	2036A WASHINGTON 2036B WASHINGTON 2036D WASHINGTON
DAVID D BRAWLEY 4724 NAMEOKI RD GRANITE CITY, IL 62040	2038 WASHINGTON
BEATRICE STENITZER 1009 GRAND MADISON, IL 62060	1009R GRAND
HATTIE MULNIK 626 LINCOLN AVE VENICE, IL 62050	1311 IOWA
DAVID CAUSEY 1033 MCCAMBRIDGE MADISON, IL 62060	1033 MCCAMBRIDGE

PHASE I HOME INSPECTION SURVEY
RECOMMENDATION LETTERS SENT TO THE FOLLOWING RESIDENTS:

TERRI L FINCK
1930 ADAMS ST.
GRANITE CITY, IL 62040

DAVID TRIPP
1938 ADAMS ST
GRANITE CITY, IL 62040

DELORES J WOLFE
1942 ADAMS ST.
GRANITE CITY, IL 62040

ALBERT PAUL
2034 ADAMS ST
GRANITE CITY, IL 62040

GENEVA BROOKS
2138 ADAMS ST
GRANITE CITY, IL 62040

THOMAS POLLARD
1911 BENTON ST
GRANITE CITY, IL 62040

GEORGE COOK
1925 BENTON ST
GRANITE CITY, IL 62040

DAVE BENNETT
2038 BENTON
GRANITE CITY, IL 62040

FAY DUKES
2157 BENTON ST
GRANITE CITY, IL 62040

LARRY J LEMASTER
2158 BENTON ST
GRANITE CITY, IL 62040

RUBY TINSLEY
2159 BENTON ST
GRANITE CITY, IL 62040

DAVID SIEGLE
2163A BENTON REAR
GRANITE CITY, IL 62040

LLOYD L CAVANESS
2228 BENTON ST
GRANITE CITY, IL 62040

MICHAEL UNFRIED
2248 BENTON ST
GRANITE CITY, IL 62040

FRED STITCH
2254 BENTON ST
GRANITE CITY, IL 62040

MELBA ANDERSON
2023 BRYAN AVE
GRANITE CITY, IL 62040

KHALDOUN SAFFAF
1728 CHESTNUT ST
GRANITE CITY, IL 62040

RESIDENT
1730 CHESTNUT ST
GRANITE CITY, IL 62040

ROBERT SCHILDMAN
1750 CHESTNUT ST
GRANITE CITY, IL 62040

RESIDENT
1708A CLEVELAND
GRANITE CITY, IL 62040

RESIDENT
1708B CLEVELAND
GRANITE CITY, IL 62040

RESIDENT
1708 CLEVELAND BLVD
GRANITE CITY, IL 62040

EUGENE HALYAMA
1919 CLEVELAND BLVD
GRANITE CITY, IL 62040

TIMOTHY VENNE
2029 CLEVELAND BLVD
GRANITE CITY, IL 62040

RESIDENT
2055A CLEVELAND BLVD
GRANITE CITY, IL 62040

BRADLEY W ROSS
2055B CLEVELAND BLVD
GRANITE CITY, IL 62040

ORLO C DERMOTT
1628 DELMAR AVE
GRANITE CITY, IL 62040

JOSEPH J YELINEK
1704 DELMAR
GRANITE CITY, IL 62040

EFFIE BAYS
1728 DELMAR AVE
GRANITE CITY, IL 62040

LORRAINE RODRIGUEZ
1747 DELMAR
GRANITE CITY, IL 62040

PAUL D WILSON
1707 EDISON AVE
GRANITE CITY, IL 62040

RESIDENT
1715 EDISON
GRANITE CITY, IL 62040

RESIDENT
1715A EDISON
GRANITE CITY, IL 62040

RESIDENT
1715B EDISON AVE
GRANITE CITY, IL 62040

LAWRENCE HOPKINS
2143 LEE AVE
GRANITE CITY, IL 62040

DENNIS CARDIN
1610 MAPLE ST
GRANITE CITY, IL 62040

BARBARA HANKS
1640 MAPLE ST
GRANITE CITY, IL 62040

JESSICA JAIME
1647 MAPLE ST
GRANITE CITY, IL 62040

JANICE MCGINNES
1713 MAPLE ST
GRANITE CITY, IL 62040

THOMAS MARSH
1739 MAPLE ST
GRANITE CITY, IL 62040

FRANK KITTEL
1741 MAPLE ST
GRANITE CITY, IL 62040

KIM LIGNOUL
807 NIEDRINGHAUS
GRANITE CITY, IL 62040

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

July 10, 1992

REPLY TO THE ATTENTION OF:

Sam Avedisan
2128 Adams
Granite City, IL 62040

A visual home inspection at 2128 Adams in Granite City, IL was recently performed as part of the NL Industries/ Taracorp Superfund Project. The purpose of the inspection was to identify potential sources of lead contamination inside your home. The following are the results of the inspection and recommendations to decrease your family's exposure to lead.

Since your home was built prior to the 1950's, there is the potential that lead-based paint, lead water pipes and solder joints may be present. Lead from these sources may be ingested or inhaled from chipping and peeling paint or dissolved lead in the water pipes. Another source of lead may be from outside soil tracked into your home by shoes and pets. The inspection did not include testing for lead but did identify possible exposure routes if lead is present.

In your home the visual inspection identified weathered paint within the utility/basement. The other rooms appeared to have no paint. There was no visual indication of lead water supply pipes and there may be lead solder joints in the kitchen, bath, or utility/basement.

The enclosed fact sheet gives a list of recommendations to reduce potential lead exposure in your home. Use of these recommendations by individual homeowners and residents is entirely voluntary. The recommendations that apply to your household are identified by a check in the corresponding box.

If you have any questions concerning your home inspection or regarding the cleanup of the NL/Taracorp Superfund Site, please contact me or Mary Ann Croce-LaFaire, toll free, at 1-800-621-8431.

Sincerely,

Brad W. Bradley
USEPA Project Manager

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

RECOMMENDATIONS TO ELIMINATE LEAD EXPOSURE IN YOUR HOME ARE:

☒ Reduce Exposure to Lead Paint

Lead in paint is common in houses built prior to 1950. It is not a hazard unless it is available as chips or dust which may be ingested or inhaled by young children. Recommendations are:

- Vacuum areas where paint is chipping or flaking carefully and cover the areas with primer, fresh paint or wall paper.
- Replace woodwork that is in poor condition.
- As an interim measure, block access to areas in bad condition by a piece of furniture so children are not able to chew on paint chips.
- Supervise children to prevent chewing on painted windowsills, woodwork or other painted areas.

☒ Reduce Lead Intake from Water

- Before using your water for drinking or cooking, let the water run for at least one minute. Teach children to do the same.
- Do not drink or cook with water from your hot water tap. Hot water is more likely to dissolve lead.
- Substitute bottled drinking water or keep a bottle of flushed water handy for children to drink (option if above not followed).
- Use only lead free solder and flux and new copper plumbing or plastic pipe when repairing water lines.

☒ Reduce Other Indoor Sources of Lead

- Remove older cribs, furniture or toys which may have been painted with lead paint from your home.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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CHICAGO, IL 60604-3590

- Do not use metal containers, such as pewter or brass pitchers, for food or beverages.

- Do not use old or imported ceramic containers or dishes which may be colored with lead glazes for food.

☐ Protect Your Child from Dust Ingestion - Indoors

- Replace furnace filters often.

- Place a good door mat at the door and teach children to wipe their feet before entering.

- Keep windows closed as much as possible to reduce dust in the house.

- Practice good housekeeping and good hygiene:
    - Vacuum rugs weekly and furniture and drapes often.
    - Damp mop floors with a high phosphate cleaner (such as Spic 'N' Span).
    - Dust furniture with an oiled cloth or damp cloth wetted with a high phosphate cleaner.
    - Wash toddlers hands and toys often.
    - Discourage thumb-sucking.

☐ Protect Your Child from Soil Ingestion - Outdoors

- Limit exposure to dirt:
    - Cover areas of exposed dirt with grass, flowers, mulch or concrete.
    - Wash down very dusty areas with a hose.
    - Discourage children from playing in dirt not covered with grass, gravel or groundcover.
    - Supervise young children to prevent the eating of dirt.

- Practice good hygiene:
    - No eating outdoors.
    - Wash hands frequently.
    - Wash toys that have been taken outdoors.

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CHICAGO, IL 60604-3590

☒ Alter Gardening Activities

- Do not dig or turn soil on windy days.
- Do not grow root vegetables (such as carrots) or leafy vegetables (such as lettuce or cabbage).
- Use gloves while gardening. Wash hands and change clothes before preparing food.
- Mulch gardens to keep the dust movement down.
- Wash all home-grown fruits and vegetables well.

☑ Practice Good Nutrition

- Maintain a well balanced diet high in Calcium, Iron and Vitamin C.
  - Foods that are High in Iron:
    - Liver, lean meat
    - Tuna fish (packed in water)
    - Eggs
    - Raisins
    - Spinach and greens
  - Foods that are High in Calcium:
    - Milk and Cheese
    - Cottage cheese and Yogurt
    - Ice Milk
  - Foods that are High in Vitamin C:
    - Fruits and Fruit Juice
    - Bell Peppers and Tomatoes
    - Potatoes, Sweet Potatoes (cooked in their skins)
- Reduce the intake of foods high in fats and oil (these foods make it easier for the body to absorb lead:
  - Foods that should be limited:
    - Butter, oil, lard, margarine
    - Potato Chips, Corn Chips, French Fries
    - Fried Foods (remove skin from chicken and fat from meat)
- Throw away food that falls on the floor.

TABLE 1

Contact Residential Letter

March 6, 1992

Sam Avedisan
2128 Adams
Granite City, IL 62040

Dear Sam Avedisan:

Woodward-Clyde Consultants, representing the **United States Environmental Protection Agency, Region 5 (USEPA)**, will be inspecting the interior of your home(s) to determine what sources of lead contamination may be located inside your home. These home inspections are in connection with the cleanup of the NL Industries/Taracorp Superfund Site.

According to the USEPA, a "Consent for Access to Property and Home" was returned granting the USEPA and its representatives permission to conduct a home interior inspection(s). Two professional inspectors will walk through your home and visually identify possible sources of lead contamination. The home inspection will take approximately one half hour. This inspection will then be used to recommend ways that you may be able to reduce the levels and/or potential health impacts of any lead contamination in your home or homes.

Woodward-Clyde Consultants would like to schedule an appointment at your convenience for the inspection. Please call our Granite City office at **451-1447** to set up your appointment time. If you have questions regarding the clean up of the NL/Taracorp Superfund Site, please contact the USEPA representative, Mary Ann LaFaire, toll free, at 1-800-621-8431.

Sincerely,

Woodward-Clyde Consultants

CHAIN OF CUSTODY RECORD

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DR.
MARYLAND HEIGHTS, MISSOURI 63043
314-429-0100

WWC-F

PROJECT NO: 889MC114V

PROJECT NAME: NL/Taracorp Superfund Site

SAMPLER'S: (Signature) Cynthia Pavelka

DATE	TIME	SAMPLE I.D. NUMBER	NO. OF CONTAINERS	Total Lead	Filter Cartridge					REMARKS
11/15,18/91	4:30pm	PASP # 6 (Personal Air Sampling Pump)	1	X	✓					
11/15,18/91	4:30pm	PASP # 7 " " " "	1	X	✓					
11/15,18/91	4:30pm	PASP # 8 " " " "	1	X	✓					
11/15,18/91	4:30pm	PASP # 9 " " " "	1	X	✓					
11/15,18/91	4:30pm	PASP # 10 " " " "	1	X	✓					

Nothing Follows
11/18/91

RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED BY: (Signature)	DATE / TIME
Karen Meyer	11/18 4:55	[signature]	11/18 1830
RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED AT LAB BY: (Signature)	DATE / TIME
[signature]	11/18 1915	[signature]	11/18 1915
METHOD OF SHIPMENT:		AIRBILL NO:	

WWC-X

CHAIN OF CUSTODY RECORD

SHEET 1 of 1
KMM

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DR.
MARYLAND HEIGHTS, MISSOURI 63043
314-429-0100

PROJECT NO: 89MC114V	PROJECT NAME: NL/Taracorp Superfund Site	
SAMPLER'S: (Signature)		

DATE	TIME	SAMPLE I.D. NUMBER	NO. OF CONTAINERS	Total Lead Filter Cartridge					REMARKS
11/22	1545	PASP #11 (Personal Air Sample Pump)	1	X					Need 24 hr. turnaround (11/25/91)
11/22	1545	PASP #12 (Personal Air Sample Pump)	1	X					Need 24 hr. turnaround (11/25/91)

CONTAINER DESCRIPTION / ANALYSES REQUESTED

RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED BY: (Signature)	DATE / TIME
Karen Meyer	11/22 4:12	[signature]	11/22 1615
RELINQUISHED BY: (Signature) [signature]	DATE / TIME 11/22 500	RECEIVED AT LAB BY: (Signature) [signature]	DATE / TIME 11/22 5 PM
METHOD OF SHIPMENT: WCC employee		AIRBILL NO:	

HOME INSPECTION SURVEY FORM

Appointment Time: ~~92/04/28~~ 92/5/6 CFP 17:30
Actual Start Time: 17:45
Residence ID: **AD2140**
Team No.: 01

HOUSEHOLD MEMBER PERSONAL INFORMATION

Name of Respondent: **JACQUILINE YEAGER**

Phone number: (Home) 877 7243 (Work) 798 3359

Address: **2140 ADAMS ST**
GRANITE CITY, IL 62040

Please Correct: ______________________

____

Do you rent? N

If **Yes**, please list landlord's name, address, and telephone number.

Landlord's name:

Address:

Phone:

How long have you lived in house: ______ 0-5 years
✓ 5-10 years ______ 10-20 years ______ 20 or more

Number of people living in house: Adults 1 Children 2

Other Comments: ______________________

Inspectors Signatures: (1) [signature]
Date: 5/6/92 Time: 17:55
(2) [signature]
Date: 5/6/92 Time: 17:55

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=================================================================
      DETAIL REPORT OF RESPONDENTS' ANSWERS MATCHING A QUERY
      Mon May 18 08:10:29 1992
      Page 2 /110
=================================================================
----------------------- SECTION A ----------------------
 1 ResIdNbr        AD2140            2 Lastname        YEAGER
 3 Firstname       JACQUILINE        4 Tel_Nbr         877-7243
 5 Wk_Tel          798-3359          6 Street_Address 2140_ADAMS_ST
 7 City_Zip        GRANITE_CITY,_IL__62040 8 Rent            No
----------------------- SECTION B ----------------------
 1 Ll_Name1        -                 2 Ll_Name2        -
 3 Ll_Tel          -                 4 Ll_Address      -
 5 Ll_City         -
----------------------- SECTION C ----------------------
 1 AcssAgree       Yes               2 LetterSent      Yes
 3 LetterDate      92/04/12
----------------------- SECTION D ----------------------
 1 ResLoc
----------------------- SECTION E ----------------------
 1 Method1         Tele              2 MethDate1       92/04/17
 3 MethTime1       16:00             4 MethMadeby1     CAG
 5 Contacted1      Yes
----------------------- SECTION F ----------------------
 1 Method2         Tele              2 MethDate2       92/04/17
 3 MethTime2       16:10             4 MethMadeby2     CAG
 5 Contacted2      Yes
----------------------- SECTION G ----------------------
 1 Method3         Tele              2 MethDate3       92/05/04
 3 MethTime3       14:00             4 MethMadeby3     CAG
 5 Contacted3      No
----------------------- SECTION H ----------------------
 1 Method4         Tele              2 MethDate4       92/05/05
 3 MethTime4       11:48             4 MethMadeby4     CAG
 5 Contacted4      Yes
----------------------- SECTION I ----------------------
 1 Method5                           2 MethDate5       -
 3 MethTime5       -                 4 MethMadeby5     -
 5 Contacted5
----------------------- SECTION J ----------------------
 1 TeamNbr1        01                2 AppSchDate1     92/04/28
 3 AppSchDay1      TUE               4 AppSchTime1     17:30
 5 AppSchMadeby1   CAG               6 SpecInst1       NONE
 7 SurveyCmp1      No
----------------------- SECTION K ----------------------
 1 TeamNbr2        01                2 AppSchDate2     92/05/06
 3 AppSchDay2      WED               4 AppSchTime2     17:30
 5 AppSchMadeby2   CAG               6 SpecInst2       NONE
 7 SurveyCmp2      Yes
=================================================================
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TABLE 2

Home Inspection Surveys Conducted
Address List - Granite City

Resident ID Number	Street Address	City and Zip Code
AD1930	1930 ADAMS ST	GRANITE CITY, IL 62040
AD1938	1938 ADAMS ST	GRANITE CITY, IL 62040
AD1942	1942 ADAMS ST	GRANITE CITY, IL 62040
AD2034	2034 ADAMS ST	GRANITE CITY, IL 62040
AD2128	2128 ADAMS ST	GRANITE CITY, IL 62040
AD2138	2138 ADAMS ST	GRANITE CITY, IL 62040
AD2140	2140 ADAMS ST	GRANITE CITY, IL 62040
BE1911	1911 BENTON ST	GRANITE CITY, IL 62040
BE1925	1925 BENTON ST	GRANITE CITY, IL 62040
BE1926	1926 BENTON ST	GRANITE CITY, IL 62040
BE1941	1941 BENTON ST	GRANITE CITY, IL 62040
BE2038	2038 BENTON ST	GRANITE CITY, IL 62040
BE2103	2103 BENTON ST	GRANITE CITY, IL 62040
BE2153A	2153A BENTON AVE	GRANITE CITY, IL 62040
BE2153	2153 BENTON AVE	GRANITE CITY, IL 62040
BE2155A	2155A BENTON AVE	GRANITE CITY, IL 62040
BE2155	2155 BENTON AVE	GRANITE CITY, IL 62040
BE2157	2157 BENTON ST	GRANITE CITY, IL 62040
BE2158	2158 BENTON ST	GRANITE CITY, IL 62040
BE2159	2159 BENTON ST	GRANITE CITY, IL 62040
BE2163A	2163A BENTON REAR	GRANITE CITY, IL 62040
BE2163	2163 BENTON ST	GRANITE CITY, IL 62040
BE2228	2228 BENTON ST	GRANITE CITY, IL 62040
BE2232	2232 BENTON ST	GRANITE CITY, IL 62040
BE2248	2248 BENTON ST	GRANITE CITY, IL 62040
BE2254	2254 BENTON ST	GRANITE CITY, IL 62040

Resident ID Number	Street Address	City and Zip Code
GR2246	2246 GRAND AVE	GRANITE CITY, IL 62040
GR2247A	2247 A GRAND AVE	GRANITE CITY, IL 62040
GR2247	2247 GRAND AVE, DOWN	GRANITE CITY, IL 62040
IO1423	1423 IOWA ST	GRANITE CITY, IL 62040
LE2029	2029 LEE AVE	GRANITE CITY, IL 62040
LE2127	2127 LEE AVE	GRANITE CITY, IL 62040
LE2143	2143 LEE AVE	GRANITE CITY, IL 62040
LE2145	2145 LEE AVE	GRANITE CITY, IL 62040
LE2161	2161 LEE AVE	GRANITE CITY, IL 62040
MA1415	1415 MADISON AVE	GRANITE CITY, IL 62040
MA1420	1420 MADISON AVE	GRANITE CITY, IL 62040
MA1423	1423 MADISON AVE	GRANITE CITY, IL 62040
MP1610	1610 MAPLE ST	GRANITE CITY, IL 62040
MP1633	1633 MAPLE ST	GRANITE CITY, IL 62040
MP1640	1640 MAPLE ST	GRANITE CITY, IL 62040
MP1647	1647 MAPLE ST	GRANITE CITY, IL 62040
MP1713	1713 MAPLE ST	GRANITE CITY, IL 62040
MP1739	1739 MAPLE ST	GRANITE CITY, IL 62040
MP1741	1741 MAPLE ST	GRANITE CITY, IL 62040
MP1747	1747 MAPLE ST	GRANITE CITY, IL 62040
NI0807	807 NIEDRINGHAUS AVE	GRANITE CITY, IL 62040
NI0821	821 NIEDRINGHAUS AVE	GRANITE CITY, IL 62040
NI0830	830 NIEDRINGHAUS AVE	GRANITE CITY, IL 62040
NI0901	901 NIEDRINGHAUS AVE	GRANITE CITY, IL 62040
NI1245	1245 NIEDRINGHAUS AVE	GRANITE CITY, IL 62040
NI1255	1255 NIEDRINGHAUS	GRANITE CITY, IL 62040
OH2014	2014 OHIO AVE	GRANITE CITY, IL 62040
OL1601	1601 OLIVE ST	GRANITE CITY, IL 62040
OL1625	1625 OLIVE ST	GRANITE CITY, IL 62040
OL1629	1629 OLIVE ST	GRANITE CITY, IL 62040

Resident ID Number	Street Address	City and Zip Code
OL1639	1639 OLIVE ST	GRANITE CITY, IL 62040
OL1720	1720 OLIVE ST	GRANITE CITY, IL 62040
OL1721	1721 OLIVE ST	GRANITE CITY, IL 62040
OL1724	1724 OLIVE ST	GRANITE CITY, IL 62040
OL1725	1725 OLIVE ST	GRANITE CITY, IL 62040
OL1744	1744 OLIVE ST	GRANITE CITY, IL 62040
OL1747	1747 OLIVE ST	GRANITE CITY, IL 62040
OL1751	1751 OLIVE ST	GRANITE CITY, IL 62040
SP1602	1602 SPRUCE ST	GRANITE CITY, IL 62040
SP1614R	1614 SPRUCE REAR	GRANITE CITY, IL 62040
SP1614	1614 SPRUCE FRONT	GRANITE CITY, IL 62040
SP1626	1626 SPRUCE ST	GRANITE CITY, IL 62040
SP1744	1744 SPRUCE ST	GRANITE CITY, IL 62040
SP1754	1754 SPRUCE ST	GRANITE CITY, IL 62040
ST2039A	2039A STATE ST	GRANITE CITY, IL 62040
ST2039C	2039C STATE ST	GRANITE CITY, IL 62040
ST2039	2039 STATE ST	GRANITE CITY, IL 62040
ST2041	2041 STATE ST, DOWN	GRANITE CITY, IL 62040
ST2119	2119 STATE ST	GRANITE CITY, IL 62040
ST2141A	2141A STATE ST	GRANITE CITY, IL 62040
ST2141	2141 STATE ST	GRANITE CITY, IL 62040
ST2150	2150 STATE ST	GRANITE CITY, IL 62040
ST2158	2158 STATE ST	GRANITE CITY, IL 62040
ST2210	2210 STATE ST	2GRANITE CITY, IL 62040
ST2216	2216 STATE ST	GRANITE CITY, IL 62040
ST2228	2228 STATE ST	GRANITE CITY, IL 62040
ST2230	2230 STATE ST	GRANITE CITY, IL 62040
ST2235	2235 STATE ST	GRANITE CITY, IL 62040
ST2254	2254 STATE ST	GRANITE CITY, IL 62040
ST2256	2256 STATE ST	GRANITE CITY, IL 62040

Resident ID Number	Street Address	City and Zip Code
TF1313	1313 21ST ST	GRANITE CITY, IL 62040
TT1510	1510 23RD ST	GRANITE CITY, IL 62040
WA1713	1713 WALNUT ST	GRANITE CITY, IL 62040
WS2036A	2036A WASHINGTON AVE	GRANITE CITY, IL 62040
WS2036B	2036B WASHINGTON AVE	GRANITE CITY, IL 62040
WS2036C	2036C WASHINGTON AVE	GRANITE CITY, IL 62040
WS2036D	2036D WASHINGTON AVE	GRANITE CITY, IL 62040
WS2038	2038 WASHINGTON AVE	GRANITE CITY, IL 62040
WS2104L	2104 LOWER WASHINGTON AVE	GRANITE CITY, IL 62040
WS2104U	2104 UPPER WASHINGTON AVE	GRANITE CITY, IL 62040
WT2612	2612 W. 20TH ST	GRANITE CITY, IL 62040
WT2636	2636 W. 20TH ST	GRANITE CITY, IL 62040

TABLE

Home Inspection Surveys Conducted
Adress List - Madison

Resident ID Number	Street Address	City and Zip Code
AL1200	1200 ALTON AVE	MADISON, IL 62060
AL1218	1218 ALTON AVE	MADISON, IL 62060
EL1603	1603 ELIZABETH	MADISON, IL 62060
EL1606	1606 ELIZABETH	MADISON, IL 62060
EL1715	1715 ELIZABETH	MADISON, IL 62060
EL1717	1717 ELIZABETH	MADISON, IL 62060
EL1723	1723 ELIZABETH	MADISON, IL 62060
EL1918	1918 ELIZABETH	MADISON, IL 62060
ER1853	1853 EDWARDSVILLE ROAD	MADISON, IL 62060
GR0808	808 GRAND AVE	MADISON, IL 62060
GR0900A	900 GRAND AVE, UP	MADISON, IL 62060
GR0900	900 GRAND AVE	MADISON, IL 62060
GR1009R	1009R GRAND AVE	MADISON, IL 62060
GR1009	1009 GRAND AVE	MADISON, IL 62060
GR1225	1225 GRAND AVE	MADISON, IL 62060
GR1325	1325 GRAND AVE	MADISON, IL 62060
GW1001	1001 GREENWOOD	MADISON, IL 62060
GW1014R	1014R GREENWOOD	MADISON, IL 62060
GW1014	1014 GREENWOOD	MADISON, IL 62060
GW1015	1015 GREENWOOD	MADISON, IL 62060
GW1018	1018 GREENWOOD	MADISON, IL 62060
GW1028	1028 GREENWOOD	MADISON, IL 62060
GW1108	1108 GREENWOOD	MADISON, IL 62060
IO0820	820 IOWA ST	MADISON, IL 62060

Resident ID Number	Street Address	City and Zip Code
IO0823	823 IOWA ST	MADISON, IL 62060
IO0912	912 IOWA ST	MADISON, IL 62060
IO1018	1018 IOWA ST	MADISON, IL 62060
IO1122	1122 IOWA ST	MADISON, IL 62060
IO1124	1124 IOWA ST	MADISON, IL 62060
IO1211	1211 IOWA ST	MADISON, IL 62060
IO1238	1238 IOWA ST	MADISON, IL 62060
IO1311	1311 IOWA ST	MADISON, IL 62060
IO1316	1316 IOWA ST	MADISON, IL 62060
IO1324	1324 IOWA ST	MADISON, IL 62060
KE1604	1604 KENNEDY DR	MADISON, IL 62060
KE1608	1608 KENNEDY DR	MADISON, IL 62060
KE1609	1609 KENNEDY DR	MADISON, IL 62060
KE1616	1616 KENNEDY DR	MADSION, IL 62060
MA1230	1230 MADISON AVE	MADISON, IL 62060
MC1033	1033 MCCAMBRIDGE	MADISON, IL 62060
ME0618	618 MERIDOCIA	MADISON, IL 62060
ME0631	631 MEREDOCIA	MADISON, IL 62060
ME0636	636 MERIDOCIA	MADISON, IL 62060
ME0641	641 MEREDOCIA	MADISON, IL 62060
ME0645	645 MEREDOCIA	MADISON, IL 62060
RE1000	1000 REYNOLDS	MADISON, IL 62050
RE1030	1030 REYNOLDS	MADISON, IL 62060
RE1032	1032 REYNOLDS	MADISON, IL 62060
RE1112	1112 REYNOLDS	MADISON, IL 62060
SA0633	633 SALVETER	MADISON, IL 62060
ST1022	1022 STATE ST	MADISON, IL 62060
ST1102	1102 STATE ST	MADISON, IL 62060
WS0919	919 WASHINGTON AVE	MADISON, IL 62060
WS0921	921 WASHINGTON AVE	MADISON, IL 62060